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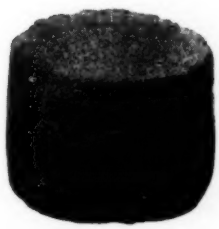

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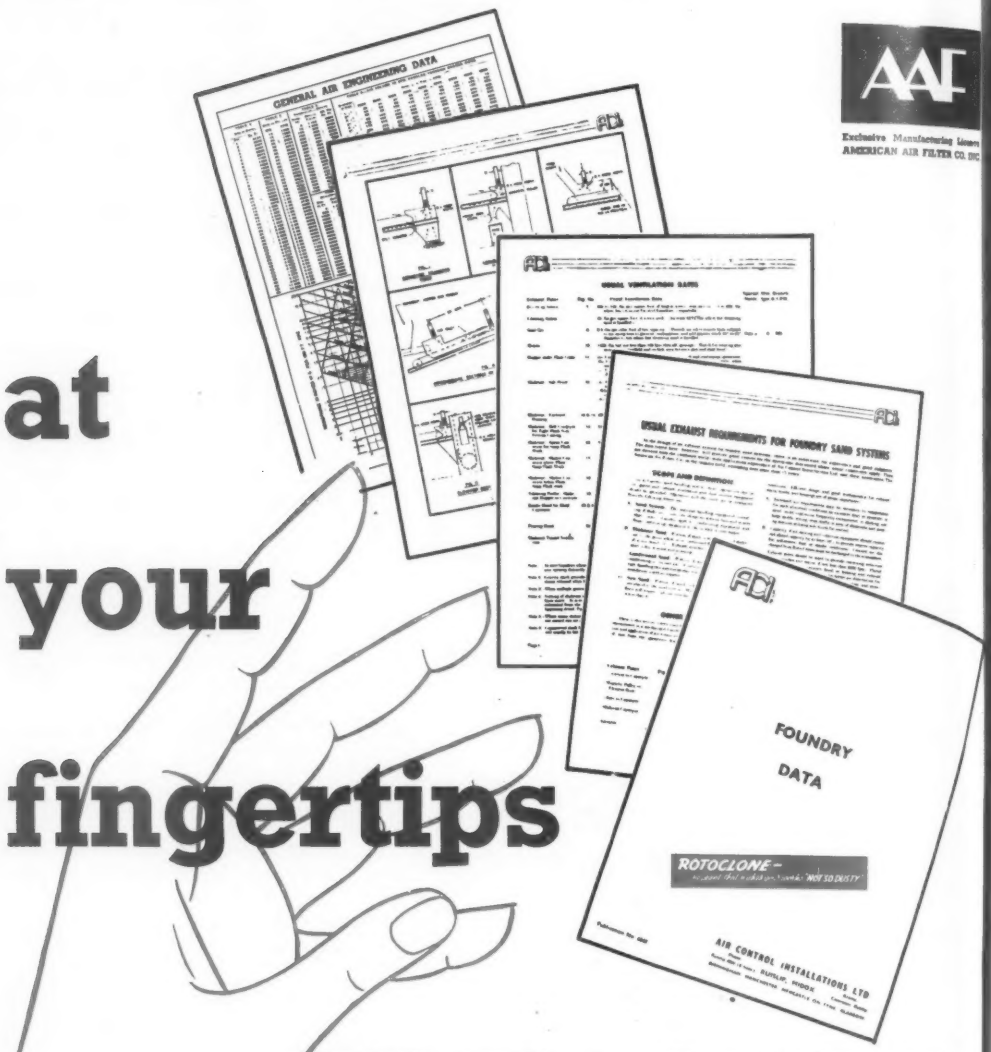

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The London Congress

The programme for the London International Foundry Congress is now established. The preliminary brochure which has been sent to members of the overseas organizations attached to the International Committee of Foundry Technical Associations has been well received and, on request, additional copies have been supplied. At the congresses held last year and in 1953 in Florence and Paris, the number of participants was of the order of a thousand and there is reason to believe that the one to be held in London will be equally popular. Thus, there is every urge for overseas foundrymen to inform their national secretaries at the earliest possible moment of their intention to participate. The organizing committee has worked hard to plan in great detail this important event. The manifestation is to have the active co-operation of Her Majesty's Government and a Government Reception, primarily for the overseas guests, is arranged. Moreover, Lord Kilmuir, the Lord Chancellor, is to be principal speaker at the banquet. The Civic Authorities, both London and Westminster, are also lending their support, and the Lord Mayor and Mayor will be honoured guests.

Much thought has been given to helping the overseas guests who either do not speak English at all or speak it insufficiently well to follow technical papers. For them, an imposing list of interpreters, of both sexes, has been empanelled. At the beginning of each technical session, a film as far as possible appropriate to the subject under discussion will be projected. A range of works visits has been chosen, which represents a good cross-section of the foundry industry—there are about 40 in all. Since the war, there have been such tremendous advances made in manufacturing technique that we believe even the most up-to-date of the visitors will find British works both interesting and instructive. The organizing committee has planned so to arrange the programme that a maximum opportunity will be given for intimate social contact amongst all those attending. The Congress opens with a garden party at the Harrow home of Mr. and Mrs. Barrington Hooper, and we know of no type of function which affords better facilities for "getting together." Much thought has been given—bearing in mind the international character of the Congress—to an entertainment to be staged at the Piccadilly Hotel and to a reception to be held at the Fishmongers' Hall. Again, the provision of a pocket-size "Who's Who" by the proprietors of the FOUNDRY TRADE JOURNAL will enable "birds of a feather" to get together.

It will be obvious to home readers that such an important gathering as this will need much finance, and generous contributions are essential to ensure its success.

E.

Watson House

It is many years since the JOURNAL first made contact with Watson House. At that time it was located at Nine Elms, Battersea, but in 1936 it removed to its present situation at Townmead Road, Fulham, S.W.6. Commemorating the name of Sir David Milne Watson, the "house" has always been the research centre for the gas industries and later for coke also. It undertakes both fundamental research and industrial development on behalf of manufacturers. The first time the JOURNAL had dealings with Watson House was in connection with the preparation of a Standard for the exit pipe for geysers fitted in bathrooms. These were required to be vitreous enamelled internally to prevent birds using them as nesting places, as such happenings had caused human fatalities. Thus, it was no surprise to the writer to find that the safety aspects of all new apparatus tested was examined with that in mind. Where, for instance, apparatus may be installed on a wooden floor or close to a panelled wall, tests are made as to the heat absorbed by the adjacent structures, and a standard is laid down as to acceptable conditions.

The original continuous-burning fire was a development emanating from Watson House. Since the employment of "nutty slack" and the like, this design of fire has been prolific in the creation of "smog." Now, it is receiving added attention—using coke as the fuel—in the light of the "Beaver Report." Systematic tests are going on to ascertain the thermal efficiency of space-heating stoves. It would seem that better efficiencies are more easily attained with the free-standing variety.

Gadgets

It is amazing the number of gas-cooker lighting gadgets there are on the market, but when the problem of lighting is related to industrial plant, a complicated electronic control system has been developed. It sweeps the system clear of any gas accumulating, lights the pilot flame, and opens the air and gas valves; using a time switch the system can start and end at any given time. In the large-scale cooking testing section, there was a "Tortoise" core-oven in commission. There are a number of applications where the foundry industry has adapted baking plant for its own purposes, but here the reverse is the case.

The writer was amazed at the attempts being made to standardize the cooking of buns and cakes. The effect of too much or too little sugar and butter was clearly shown—and no doubt reflected in the taste. Further tests showed the influence of time and temperature. Still it is to be hoped that science will never replace art in cooking. Prior knowledge as to the precise flavour of a dish or bun takes the edge off one's appetite.

The activities of Watson House are diverse, practical, and of great commercial significance—especially to the foundry industry. This two-acre establishment is visited by a very large number of industrialists and if any readers making coke- or gas-burning appliances have not yet been there, they should remedy the situation as soon as possible.

Brassfounders' Advisory Service

Due to the poor response received from firms in the area, it has been decided to cancel the arrangements for a meeting in Manchester on Monday, March 7, which had been previously announced.

Vacuum Furnace for BCIRA

Ceremonies commemorating the shipment of its 100th commercial-size vacuum melting furnace were held at National Research Corporation of Cambridge, Massachusetts, recently. These have special significance, because the furnace is destined for the British Cast Iron Research Association's laboratories at Alvechurch. The State governor Christian A. Herter presented to Mr. William Barker, British consul-general in Boston, a plaque marking the shipment of the furnace, through the Department of Scientific and Industrial Research. The ceremony was attended by representatives of a number of the country's leading producers and consumers of high-performance metals produced in vacuum furnaces (see Fig. 1). The shipment of the 100th vacuum furnace is significant because it is typical of the growing industrial use of vacuum furnaces. During world war II, and immediately thereafter, vacuum furnaces were used principally by government installations for processing of uranium and other metals required for the atomic-energy programme. Beginning about five years ago, increasing industrial interest was shown in the use of vacuum furnaces for producing superior metals and alloys for such products as bearings, jet-engine turbine-blades, electronic tubes, magnetic alloys, and sintered cutting tools. Vacuum furnaces are also used industrially to produce reactive metals such as titanium and refractory metals such as molybdenum.

FIG. 1.—*Examining the interior of the furnace destined for the British Cast Iron Research Association (left to right):—Mr. William A. Coolidge, chairman, and Mr. R. S. Morse, president, National Research Corporation; Mr. Christian A. Herter, governor of the Commonwealth of Massachusetts; Mr. Richard Preston, commissioner of the Department of Commerce; and Mr. B. William Barker, British consul-general in Boston.*

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Nodular Cast Iron*

Present Position and Future Prospects as an Engineering Material, with Special Reference to Suitability for Crankshafts

London Discussion of the Paper by S. B. Bailey, M.Sc. (Eng.), M.I.Mech.E.†

[SLIGHTLY ABRIDGED]

When Mr. Bailey's Paper was presented last year, it was regarded by many knowledgeable foundrymen and technicians as being highly controversial in a number of its aspects. These points were commented upon at length at the meeting. After the Paper had been printed in the JOURNAL *numerous requests were made that the London discussion should be reproduced, also, so that others interested in the subject could have their views ventilated. It is proposed therefore in this and subsequent issues of the* JOURNAL *to print that discussion* in extenso.

The section in this issue records the comments of Dr. J. G. Pearce, O.B.E., M.Sc., and Dr. H. T. Angus (both of the British Cast Iron Research Association), Mr. H. L. Cox, M.A., Dr. A. B. Everest (Mond Nickel Company, Limited), and Dr. M. L. Becker (British Iron and Steel Research Association).

Dr. H. T. ANGUS, in opening the discussion, said that the Author had collected much information from a wide range of sources, which had hitherto been scattered and which had tended to be inaccessible, and had brought it into the compass of one Paper. The Paper itself set out to summarize the mechanical properties, the commercial uses and the economics of use of nodular cast iron, but the mode of presentation implied that the slow development in the use of nodular iron had been the result of failures, rather than the inherent caution, both in the foundry and engineering industries, which had delayed the large-scale application of a material whose properties were imperfectly known.

It was, after all, reasonable to expect, in any new process, that difficulties would arise, both in production and application, but he himself knew of no evidence to confirm that engineering and research organizations had lost confidence in the material, and the number of cases of castings which had broken in transit or on first test must be so small as to bear comparison with similar failures in other conventional engineering materials.

There was a constant emphasis throughout the Paper on the point that unless the price was substantially reduced the use of the material would be entirely restricted. That was only partly correct. A new material that cost no more than its nearest counterparts, and offered substantial manufacturing advantages, was rarely handicapped unduly, and the implication that its present cost was a major factor restricting its use was almost certainly incorrect. To imply also that wartime shortages of low-phosphorus ores and nickel were likely to be another major restricting factor rather ignored the fact that even in the previous fifty-four years there had been forty-four years of peace.

There was a constant insistence on the importance of the basic cupola as a means of reducing the cost of production of nodular iron. It might be as well to remember that the basic cupola itself had not as yet had all its difficulties removed and its own cost of operation was not low. In his opinion, far more attention ought to be paid to the use of batch-melting methods, since in Britain, in particular, the possibility of long runs of production of nodular iron was confined to one or two industries, but the jobbing demand was growing markedly.

In making comparisons between the brittleness of materials based on conventional tests, the scale of presentation had always to be borne in mind. If, for example, in Fig. 13, it was attempted to include a curve of brittleness of low-phosphorus and high-phosphorus iron, the two would fall so close together and be so low that any difference would appear to be entirely insignificant. In actual practice, of course, the difference was sufficiently marked for the one material to be acceptable and for the other to be useless for many classes of work. The significant factor about nodular irons was not so much that the impact strength was substantially lower than that of the cast carbon steels, but that it was four to ten times as great as that of grey cast iron which, after all, had proved to be a structurally reliable material.

In comparing the material with traditional malleable-iron and steel castings, it was unwise to draw conclusions as to its likely usefulness on the basis purely of price and mechanical properties. There were many cases, for example, in which steel castings were specified merely because grey iron was just not sufficiently resistant to shock for the

Paper presented to the Institution of Mechanical Engineers and printed in the JOURNAL, May 20, 27 and June 3, 1954. Permission from the Institution to print the discussion is gratefully acknowledged.

† The Author is on the staff of Intelligence Division, London Headquarters, Department of Scientific and Industrial Research.

purpose, and the section was too great for malleable iron. In cases like that, nodular iron had an obvious field, since it was free from many of the founding difficulties of cast steel, and had considerably improved machinability.

Torsional Fatigue

The Author has made the interesting point that in his opinion torsional fatigue accounted for more crankshaft failures in service than did bending fatigue. That might well be the case with steel shafts, of which he personally had no experience, but in cast-iron shafts it was his impression that bending fatigue was the more usual form of failure, and, indeed, as the Author had remarked, Table IV (Appendix V) showed that the ratio of fatigue strength to tensile strength in reverse torsion was much higher for flake-graphite cast-irons than in the wrought alloy steels.

The implication in the footnote concerning the work of Love, however, that for nodular cast iron it would be wise to assume that the notched torsional fatigue strength was not more than 15 per cent. of its ultimate tensile strength would seem to err on the side of caution, as it reduced the notched torsional fatigue strength to that of ordinary high-duty iron.

The Author's comment that the engine had to be designed around any cast-iron crankshaft was undoubtedly correct, and those remarks would also apply equally with nodular iron as with high-duty grey cast iron. The Author had made an important point in his comment that ductility was not, in general, a requirement for crankshafts of any kind. In by far the majority of cases the fatigue strength, both in bending and torsion, was of far greater importance than ductility, and in many conventional materials higher fatigue values were likely to be obtained in harder materials where the strength was relatively high and the ductility relatively low.

In Fig. 16 the Author had shown caution in accepting the figures for the limit of proportionality at temperatures of 425 to 450 deg. C. quoted by Saunders and Sinnott (1953). The few results which had been obtained at the British Cast Iron Research Association, however, tended to confirm those findings. Proof-stress figures of 0.1 per cent. at 500 deg. C. showed approximately 17.5 tons per sq. in. for a pearlitic nodular and 10.3 tons per sq. in. for a ferritic nodular iron.

The apparently slow adoption of the process over the preceding seven years might well prove, in the long run, to have been of advantage to the industry as a whole, since it had prevented any widespread ill-considered exploitation of the material which might easily have produced an embarrassing crop of failures. Although a substantial amount of nodular iron had been employed in Britain, and very considerable quantities in the United States, he personally had met no failures which were attributable to the imperfections of the material itself, and he considered that, in comparison with any other new material which had been introduced in recent years, a world-wide commercial usage in excess of 50,000 tons per annum within seven years of the process having been devised indicated that progress had not been so slow as the Author would indicate.

Nomenclature

Dr. A. B. EVEREST said that he was puzzled as to just what the Author's object was in reaching his various conclusions, particularly as it seemed that many of those conclusions did not agree with the data that he had given. He feared that he himself did not consider that the Paper was a very fair one, and he considered that it was likely to lead to a certain amount of misunderstanding.

The Author had written the paper under the title " Nodular Cast Iron." For many years past the term " nodular " had been associated with the graphite form found in malleable cast iron. When the new iron had first been announced, the term " nodular " had been applied initially on account of an apparent similarity to malleable in regard to properties. Reference to Figs. 2 and 3 clearly showed that the graphite forms were, however, quite different, and it was for that reason that European metallurgists and foundrymen associated with the development of that new material had adopted the more accurately descriptive name " spheroidal-graphite cast iron " (s.-g. iron, for short). Anyone studying the literature would know that the current trend was towards the use of the latter name, and in that respect the Author seemed to be rather out of date.

The Author had reviewed the properties of s.-g. iron, and in that connection was to be congratulated on his industry in presenting the known facts in a new manner. He claimed that the rate of development of s.-g. iron had been slow and complained of lack of data on certain properties. He should be reminded that it was less than five years since it had entered commercial production in that hemisphere, and that it normally took many times that number of years to establish a new material and to accumulate the type of detailed information he expected. It had to be remembered that in cast iron one was dealing with a highly complex alloy, and the new iron had inevitably had its share of teething troubles. He submitted that the amount of data at that time available on s.-g. iron and the progress made in its adoption were truly remarkable, when taking into account the relatively short time that had passed since its introduction to engineers.

Applications

Concerning the scale on which it had been adopted, it ought to be recalled that engineers were traditionally cautious and the tendency, particularly in Britain, was to wait for others to carry out service trials. It was that overcaution in Great Britain which had led to a relatively slower rate of development there than in many other countries. However, though development in Britain might have appeared slow, the adoption of s.-g. iron had been proceeding steadily, and it was already well established and proving a versatile and adaptable material for many engineering components. Those applications were based mainly on the combination of the good

inherent properties of cast iron, such as its easy castability, wear resistance, good machining characteristics, etc., coupled with the enhanced mechanical properties now available in s.-g. iron.

The Author had focused attention on crankshafts —an application for which s.-g. iron had already been used with outstanding success in service. The fact ought not to be overlooked, however, that s.-g. iron was being adopted in almost all fields where castings were used, and it had many other applications of equal or even greater importance. He would particularly mention gears, where experience had shown that s.-g. iron gave long life under arduous conditions. It offered important production economies and service performance often exceeding that of more conventional metals. In that connection it had proved outstanding for large girth gears used as-cast, up to the other extreme of small machine-cut, heat-treated gears for power transmission. In those it had shown adequate strength, resistance to wear and quiet running. Gear factors were being developed, and it was hoped to report on them in the near future.

He would also mention metal working rolls which represented an outstanding example in which s.-g. iron offered the good wear resistance and surface characteristics of cast iron allied with mechanical properties which had led to greatly improved performance and life in the mill, with, in particular, reduced roll breakage. S.-g. iron was proving suitable for many other wear-resisting parts, particularly on account of its hardenability. Those parts included dies and tools of all types for both hot and cold working and many machine tool and other components subject to rubbing or friction, where improved strength was desired.

High-temperature Service and Toughness

In discussing properties and applications, he would particularly refer to two other points. The Author had made passing reference to s.-g. iron for high-temperature service, and had referred to the lack of data on strength under those conditions. In that field, s.-g. iron was already established as offering greatly improved heat resistance with greater stability and less growth than were experienced with ordinary iron. Concerning high-temperature strength, the Author had overlooked that some creep data had already been published which indicated that from that point of view, s.-g. iron was equal to, or even better than, plain carbon steel up to a temperature of 450 deg. C., and had useful creep strength up to even 600 deg. C. Creep tests, however, notoriously took a great deal of time; researches were in hand and a full survey of the creep strength of the new iron would be made available as soon as possible.

The Author seemed unimpressed with the toughness or impact strength of s.-g. iron, but his views did not coincide with those expressed by metallurgists and engineers throughout the world. The increased toughness of the new cast iron was now regarded as its outstanding asset and made it a most valuable addition to engineering materials. It was already used for many parts subject to shock loading in plant and machinery of all types. The Author stated that the s.-g. irons would not be likely to show up very well in naval applications where high shock loads were likely to be experienced, but already s.-g. iron was being accepted by registration authorities in many countries of the world for shipboard applications. Of most significance was the fact that, following extensive studies in the Naval Research Establishment in the United States, a specification for shipboard castings had now been issued (Mil/I/17166/A (Ships)). That specification covered the use of annealed s.-g. iron for shipboard applications, including electrical equipment, engine blocks, pumps, compressors, gears, hydraulic equipment, valves and staging clamps.

One final point which in his opinion required comment was that the Author had suggested that s.-g. iron castings were not weldable. It was true that, initially, difficulty had been experienced with welding, but the development of suitable welding rods and techniques was well advanced and that formed the subject of a Paper to the Institute of British Foundrymen's conference.*

In his opinion, the Author's Paper was far from fair to s.-g. iron, and the Author's approach to the subject represented almost a disservice to the development of that remarkable new metal. It was generally admitted to be of great promise and was being taken up enthusiastically throughout the industrial world. It was entering into every field of enginering practice, where for many applications it was proving advantageous and competitive to the more conventional materials available.

Fatigue Resistance

Mr. H. L. Cox, M.A., A.M.I.Mech.E., said that he would refer to the fatigue resistance of cast iron and, particularly, to the relation between its resistance to bending and torsion, and to its sensitivity to stress-concentration effects. Flake-graphite iron was relatively very insensitive to notch effect, at least in small pieces. That was shown in Table II: a notch which reduced the fatigue strength of steels by 30 to 60 per cent. reduced the strength of flake cast iron by less than 10 per cent. in most cases and in only one instance by over 30 per cent. Another remarkable feature of such flake irons was their high resistance to torsional fatigue by comparison with their resistance to bending. Fig. A showed the results of tests made under combined alternating stresses—the tests were those of Gough, Pollard and Clenshaw (1951).

Temporarily one might regard the curve as just a fair line drawn through the experimental points. The feature to notice was that that curve cut the axis of bending at right angles, but cut the other axis obliquely. In other words, a small range of torsion superposed on bending had only a slight effect, whereas a small range of bending superposed on torsion had a large effect. It should be remarked

* Ball, F. A., and Thorneycroft, D. R. Paper presented to Inst. British Foundrymen in June, 1954, "Metallic-arc Welding of Spheroidal-graphite Cast Iron" (see JOURNAL October 28 and November 4, 1954).

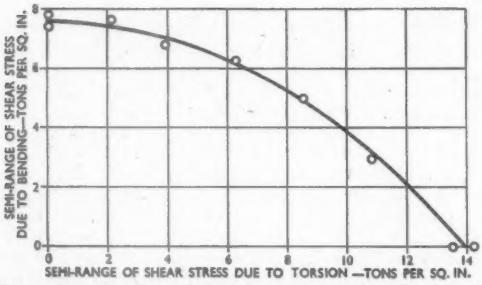


FIG. A.—*Results of fatigue tests under combined alternating bending and torsion on "Silal" cast iron.*

Theoretical curve for elliptical cylindrical holes with axes in ratio 5/1; ° Experimental points.

that for steels the similar curves were usually elliptical and cut both axes at right angles. Actually, the curve shown in Fig. A. was drawn on the assumption that the flakes of graphite represented holes of some typical elliptical form but distributed at all possible orientations, and that failure always occurred at the region of high stress at the ends of those elliptical holes. The fit to the experimental points of that curve representing holes five times as long as they were wide was as close as could be hoped and, in two other instances, similarly good fit was obtained.

The same analysis applied equally well to round holes and yielded the curve in Fig. B; in that case tests made on pieces of seven steels pierced by a diametral round hole conformed about as well to the theoretical curve. By comparison, therefore, it seemed reasonable to conclude that the interpretation of the results for cast iron on those lines was justified.

The theoretical stress-concentration factor for the 5/1 elliptical hole was about 10. Therefore, the material, being subject already to so high a factor, was unlikely to be sensitive to a superposed factor of 3 or 4 unless that superposed stress concentration extended over a sufficiently large region to include a representative sample of the inherent flaws, so that one flaw at least might exert its full effect on the higher basic stress level. That was probably the reason why notches of 0.04 to 0.07 in. deep had so little effect, and it was also fully consistent with the marked size effect recently found by Love (1953).

It surprised him that the effect in nodular irons of notches only a little deeper 0.09 to 0.14 in. should be so much greater, and it would seem worth while to explore both size effect and fatigue under combined stresses for those nodular materials.

Bright Future

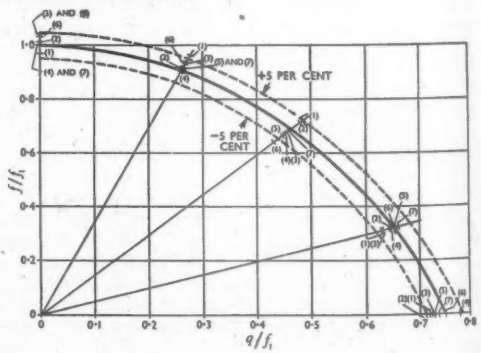
Dr. J. G. PEARCE, O.B.E., M.Sc., M.I.Mech.E., M.I.E.E., said that all branches of engineering made use of iron castings and engineers would agree that the remarkable results achieved from nodular cast irons indicated a bright future for that virtually new engineering material, in spite of the teething troubles over-stressed by the Author. That future was largely tied up with the development and production of nodular iron by the methods that had been established.

Although intensive efforts had been made in laboratories in many industrial countries, no practicable commercial alternative to the cerium/magnesium process was at present in sight, in spite of the fact that the bibliography of published scientific and technical contributions to, and patent applications in, that field from a dozen countries—excluding duplicate, descriptive and commercial material, and trivial matter—comprised between 600 and 700 items. In particular, great efforts had been made in Britain and in the United States to accomplish nodulization by the use of calcium, but, except in special circumstances and with the aid of temperatures not normally achieved in a foundry, it was not at present a practicable commercial process.

Neither the precise mechanism of the process nor the exact function of the nodulizing agents was known, but the British Cast Iron Research Association recognized both the limitations of the use of cerium alone and the value of the part played by magnesium. Unless raw material supply conditions were exceptional, it recommended the double treatment, cerium/magnesium, method to ensure freedom from processing difficulties and had no doubt that that treatment ensured complete nodulization if a recommended procedure was faithfully followed. Many of the early difficulties referred to by the Author arose from the inhibition of the action of magnesium due to the presence of small quantities of trace elements in raw materials, pig-iron and scrap, much more common, incidentally, in Europe than in the United States. The establishment by Morrogh in the Association's laboratories of the safe limits for those elements and that cerium was an effective antidote to their harmful

FIG. B.—*Comparison of fatigue-test data on test-pieces containing circular holes, with theoretical curve.*

Materials tested: (1) 0.4 per cent. carbon steel (normalized); (2) 3 per cent nickel steel, low-carbon (oil-hardened and tempered); (3) chromium/vanadium steel (oil-hardened and tempered); (4) 3—3½ per cent. nickel steel (oil-hardened and tempered; (5) 3½ per cent. nickel/chromium steel (oil-hardened and tempered); (6) 3½ per cent. nickel/chromium steel (embrittled); and (7) nickel/chromium/molybdenum steel (oil-hardened and tempered).



effects, had disposed in the main of those early difficulties.

Since any cast iron containing graphite could be nodulized, and since in the wide variety of modern cast irons practically any metallurgical structure could be made to predominate to suit specified service requirements, care ought to be taken in comparisons of nodular with flake-graphite irons to compare like structures with like. Furthermore, in considering alloyed irons, the nodulizing additions were not regarded as alloying in the usual sense, although when nickel and/or copper were present as a vehicle for the introduction of magnesium they had their usual alloying effects, albeit not added for the specific purpose of producing an alloyed cast iron. Comparatively little work had so far been published on the alloyed nodular irons, but austenitic, austenitic-martensitic, and acicular irons in that form were being manufactured. The appropriate committee of the British Standards Institution was considering the preparation of a national specification for nodular irons in the form in which the greatest tonnages were likely to be used in engineering, namely, as pearlitic, ferritic or mixed pearlitic-ferritic structures.

Patent Position

The Author had referred to the patent situation and prospective makers and users might well be forgiven for regarding it as confused. The British Cast Iron Research Association held the main cerium patent for the production of nodular iron in the United Kingdom. The Association had made nine further applications in the United Kingdom, all of which had been granted except one, referred to indirectly by the Author, which was pending. Over 50 applications had been made in some 16 industrial countries overseas, over 30 of which had been granted and the remainder were pending.

The Author had quoted the royalty basis for the magnesium process and to avoid misunderstanding it ought to be stated plainly that the production of nodular iron involving the use of cerium required a licence from the British Cast Iron Research Association, the royalty being ten shillings per ton of raw castings made in the United Kingdom for commercial use or sale. Overseas makers were similarly licensed for fifteen shillings per ton and the difference reflected the fact that United Kingdom makers had already contributed in part to the cost of the original work. A number of licences had already been issued in Britain and abroad, and the wide experience of the Association in that field and its active assistance in both equipment and staff were available to licensees under the appropriate patents. The Association recommended a prospective licensee to embark on the manufacture of nodular iron as a specific act of policy and to back that with the necessary technical resources.

DR. M. L. BECKER said that he would confine his remarks to questions concerning the fatigue strength of nodular iron to which Mr. Cox had already referred. He had been surprised to note the low values of nominal fatigue strength for crankshafts as given in the last column of Table III (Appendix IV). On the other hand, the values for plain and notched reversed bending fatigue tests given in Table II (Appendix II) were more in line with what was to be expected and he assumed that the discrepancies were due to stress raisers and size effects in the crankshafts.

The Author had pointed out that nodular cast iron could be hardened by induction or by flame and had given some examples, illustrated in Fig. 11. Whilst those processes were generally applied in order to obtain increased wear resistance, they could, when properly carried out, confer very substantial improvements in fatigue resistance. That could be attributed partly to the increased strength of the hardened skin and partly to the marked residual surface compression stress which resulted from that type of hardening and which to some extent offset the adverse stress-concentration factors associated with graphite particles and with grooves, holes, changes in section, etc.

Foundry Coke Merchants' Association

The sixth annual banquet of the Foundry Coke Merchants' Association was held last Thursday at the May Fair Hotel, London, with Mr. R. J. McDonald, M.INST.F., the chairman, presiding. With him at the high table were Mr. J. Y. Feggetter; Mr. C. F. Sullivan; Mr. John Bell (president of the Institute of British Foundrymen); Mr. R. H. Thornley; Mr. H. Basil Darby; Mr. Arnold Carr; Mr. H. H. Prosser; Mr. J. F. Stanier; Mr. Barrington Hooper, C.B.E.; Mr. E. Marvill; and Mr. W. Armstrong. The assembly of 200 members and guests included a number of well-known foundrymen. After the "Loyal" toast, "The Guests" was proposed by Mr. McDonald and replied to by Mr. Feggetter and Mr. Barrington Hooper. Mr. Bell proposed the toast of "The Association" and Mr. John Charrington responded. Light entertainment was provided by "The Voltaires" and "Barry Manning and the Champagne Girls." The organization of the function was admirably carried through by Mr. R. S. B. Hearn.

Latest Foundry Statistics

According to the British Iron and Steel Federation, employment in the steel foundries on December 4, 1954, was 19,847 which showed an increase of 143 over November 6 and 255 over October 9. The average weekly output of steel castings during November was 5,800 tons—a fairly constant figure in recent months.

Reported by the British Bureau of Non-Ferrous Metal Statistics, the output of copper-base castings during December was 5,741 tons and for 1954, 60,930 tons. This compares favourably with a production of 50,093 tons during 1953. The production of unalloyed copper castings is estimated at 6,000 tons for both years.

From figures of the Ministry of Supply, the production of aluminium castings during November was, as sand-castings, 2,038 tons; as gravity-die-castings, 4,152 tons; and as pressure die-castings, 1,530 tons. The output of magnesium-alloy castings was 410 tons.

Sweating Rate as Index of Heat Stress

The improvement of environmental working conditions with the object of increasing the safety, comfort and efficiency of the individual became of particular importance during the war, and the application of this principle to the conditions in HM Ships was one of the primary concerns of the Royal Naval Personnel Research Committee set up by the Council in 1942 at the request of the Board of Admiralty. Studies were made of the rigorous conditions encountered in warships in tropical waters, and it became necessary to investigate the suitability of the scales for these exceptionally severe environments. In the course of the climatic experiments at the National Hospital, Dr. B. McArdle and his colleagues, working with artificially acclimatized subjects, concluded that effective temperature was inadequate in certain conditions which approached the limit of endurance, but that the rate at which a man sweats could be made the basis of an index of the heat stress to which he is subjected. They therefore used the extensive information accumulated from their experiments to adapt this new index of physiological stress for practical use in the form of a nomogram. With this device, it was possible to predict the amount of sweat which a man would lose during an exposure of four hours to various working conditions and wearing different clothing.

Delayed Publication

Owing to the pressure of other work, the important findings of Dr. McArdle and his colleagues were not published at the time but were presented to the Royal Naval Personnel Research Committee in reports which had only a restricted circulation. Professor G. L. Brown, then secretary of the Committee, suggested that a more complete consideration of the two scales of warmth and of their respective advantages should be made, and for this purpose Dr. McArdle generously put his records at the disposal of Mr. F. E. Smith, who has carried out the statistical comparison now reported in a Memorandum issued by the Medical Research Council and published by HMSO (price 2s.).

Mr. Smith confirms that predictions based on effective temperature are less accurate than those made directly from the sweat-rate scale, but he points out that errors by either method may be large in certain circumstances. More work will be necessary if these shortcomings at limiting conditions are to be removed or reduced. It is thought that even as they stand both these indices of warmth are of importance to those concerned with the well-being of workers in hot conditions.

European Steel Output

It is reported from Luxembourg that steel output in the six countries of the European Coal and Steel Community in January reached the record level of 4,132,000 tons. New output records were set up by both France and Italy, but production in the other countries was slightly below the peak reached last year.

The January figures, with the monthly averages for 1954 shown in parentheses, were as follow:—

Germany, 1,627,000 (1,453,000) tons; Belgium, 457,000 (416,000) tons; France, 1,028,000 (885,000) tons; Saar, 254,000 (234,000) tons; Italy, 424,000 (348,000) tons; Luxembourg, 263,000 (236,000) tons; Netherlands, 79,000 (77,000) tons.

The total for January was 4,132,000 tons, compared with a monthly average in 1954 of 3,649,000 tons and in 1953 of 3,303,000 tons.

SCOW and RTB Profits

Profits earned by the Steel Company of Wales, Limited, in the year ended October 2, increased fourfold on the previous 53 weeks, the figure of £8,285,625 comparing with £2,082,208 for 1952-53. This was arrived at after providing for depreciation of £3,570,547 (against £3,336,015), and debenture, loan, and other interest of £2,393,043 (£2,289,166). Setting aside £4,100,000 (£1,500,000) to tax equalization account towards the postponed tax liability, and providing £100,000 (nil) for profits tax, net profits came out at £4,085,625 (£582,208). The maintained dividends of 4 per cent. required £372,592 (£366,947), and £800,000 (nil) was allocated to reserve for obsolescence, leaving £3,728,240 (£815,207) to go forward.

A substantial increase was also shown by Richard Thomas & Baldwins, Limited, and its subsidiaries. The group returned net profits of £8,171,987 for the year ended October 2—an increase of £1,327,029 compared with the previous 53 weeks. These were arrived at after allowing for depreciation of £1,569,343 (against £1,457,965), and for debenture and loan interest of £150,823 (£179,431). Taxation required £4,134,785 (£3,713,163), leaving £4,037,202 (£3,131,795).

The parent company's profits came out at £6,185,646 (£4,679,827), after crediting surplus provisions of £2,199,379 (£1,626,925). Dividends absorb £804,029 (£791,847). General reserve receives a further £3,000,000 (£1,500,000), while £1,360,000 (nil) is reserved for obsolescence and £268,000 (nil)—reduction in tax attributable to investment allowances—goes to investment allowances reserve, leaving £6,940,626 (£6,187,009) to go forward.

Plastics has Final "S"

The common misuse of the word "plastic" when describing articles made from various types of plastics was discussed at a meeting of the council of the British Plastics Federation. It was pointed out that there is the authority of the British Standards Institution for writing plastics with a final "s," this being included in BS 1755 Glossary of Terms Used in the Plastics Industry published in 1951. "Plastics" are defined as:—

"A wide group of solid composite materials which are largely organic, usually based on synthetic resins or upon modified polymers of natural origin and possessing appreciable mechanical strength. At a suitable stage in their manufacture most plastics can be cast, moulded, or directly polymerized to shape. Some plastics are rubberlike, while some chemically modified forms of rubber are considered to be plastics. "The noun," the glossary continues, "may be used adjectivally to describe an article or substance as being composed of, or as being, a material in the group mentioned in the definition. Used thus the word is distinguished by its terminal "s" from the adjective "plastic" signifying the susceptibility of a material to plastic deformation."

The council decided to encourage the widest possible use of the terminal "s" in the adjective in accordance with the British Standard.

THERE WAS AN ATTENDANCE of more than 1,100 at the annual staff dance of Thos. W. Ward, Limited, at the Cutlers Hall, Sheffield, on February 18.

LLOYDS (BURTON), LIMITED, one of the subsidiaries of F. H. Lloyd & Company, Limited, Wednesbury, on February 15 gave in Birmingham a showing of the Lloyd film "One off or a Million off."

Large Cast-iron Pipe Manufacture

Phases of Production at Stanton Ironworks Company, Limited

Three aspects of the production of large cast-iron pipes were dealt with in the following Papers which were submitted for a short-paper competition organized by the East Midlands branch of the Institute of British Foundrymen. The first concerns pattern-store layout and organization, particularly as to the method of ensuring easy assembly and checking of pattern components for large-pipe production. Loam-block pattern- and core-making are dealt with in the second contribution, where the methods adopted for making pipe-specials up to 7 ft. 6 in. dia., with a minimum of tackle, are given in detail. In the third paper a novel method of shell core production for large pipes required in quantity is described. Resin-bonded sand and a hot corebox are used, with a special device to feed the resin/sand between the corebox and a former.

Pattern Control

By J. Bell

This Paper deals with the organization for the control of pattern equipment, an essential feature of the successful running of any modern mechanized foundry. It refers particularly to a pipe foundry manufacturing approximately 250 different types of castings from 12 to 24 in. dia., and weighing between two and 13 cwt. It is unusual for any one type to be in production for more than a day at a time. Therefore, it will be realized that there is a considerable amount of pattern changing to be done. To accommodate the 4,000 items of tackle necessary for this variety of work a "special" pattern store is provided.

Storage Facilities

In the pattern store, there is an area set aside for the machines which are necessary for the routine maintenance of patterns, and also an area for the setting up and preparing of patterns before they go into the foundry. The remainder of the store is divided into avenues to segregate the various sizes of pattern. The more frequent the demand for a certain size of casting, the nearer the setting-up area is the pattern located. To make the most efficient use of the available space, some of the patterns of the same type are stacked one upon the other, using packing timber or specially-constructed timber frames.

The system of pattern storage is as follows:—Every avenue is divided into areas of the particular size and shape to accommodate individual items of pattern equipment. Each avenue has a reference letter and each area is numbered along the row. This gives any particular item a reference such as B3 or F6, which is painted on it to enable the patterns to be stored in the correct position after use, without the need to consult drawings. Down the side aisle opposite each avenue is a sign board giving the reference letter of the avenue and a plan view showing the location and number of each area in the avenue; this is shown on Fig. 1.

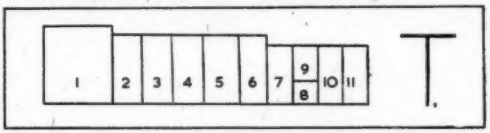


FIG. 1.—*Pattern-store marking board, showing the area and location of each group in an avenue.*

To enable a record to be kept of the pattern tackle and moulding procedure for any particular type of casting, a dual card-index system is in operation. On one card is a list of all the items of tackle required for that job, giving their store reference, drawing reference, the number required, the number in stock and, in some cases, an order point. This order point refers to items which may break during use. To allow for this eventuality, a number of the particular items are kept in stock. When an order for replacement of any item is made, the number ordered and the date of the order are noted on the record card. Fig. 2 is a typical record card, showing that the corebox cope for the job in question was sent to the machine-shop for an overhaul on March 8; three core-irons were ordered on March 4, and that 17 core-irons are in stock.

FIG. 2.—*Record card bearing a list of tackle required for a particular job, its whereabouts and the order and stock position of sundries. The example shown relates to a pipe-bend 18½ in. dia.*

Item.	Store Ref.	Drawing Ref.	Required No.	Order point.	No. in stock	Order.	Date of order.	Remarks.
Pattern cope ..	T 2	N.W.F. 271	1	—	1	—	—	—
Pattern drag ..	T 2	N.W.F. 271	1	—	1	—	—	—
Corebox cope ..	T 3	N.W.F. 209	1	—	1	—	—	To machine-shop for overhaul 8.3.54.
Corebox drag ..	T 3	N.W.F. 209	2	—	2	—	—	—
Core-irons ..	O/8	N.W.F. 213	18	17	17	3	4.3	—
Ingates	P F	N.W.F. 207	2	—	2	—	—	—
Downgate ..	P F	N.W.F. 207	1	—	1	—	—	—
Core frame ..	T 5	N.W.F. 162	1	—	1	—	—	—

Large Cast-iron Pipe Manufacture

On the other card, information concerning moulding procedure is given (Fig. 3). When moulding a pipe-bend without using chaplets, the core is set low at the back of the bend. During casting, the core is lifted or rolled by pressure of the inflowing metal to its correct central position. The item on the card marked "core setting" refers to this. Any alteration to such things as the running system or pouring temperature are immediately noted on this second card. In conjunction with this dual-card system, there are defect sheets, on which minor defects and causes of scrap, which have been encountered in previous runs are noted, together with possible cause and cure.

Data sheet for 18½-in. pipe bend.

	Class B.	Class D.
Core setting	¼ in. under body bridge	¼ in. under body bridge
Pouring temperature (deg. C.) ..	1,230 to 1,250	1,210 to 1,230
Pouring time (sec.) ..	44	58
Ramming time cope (min.) ..	2	2
Impeller Rammer feed	2½ in. gate height	2½ in. gate height
Dia. of ingate (in.)	0.75	0.81
Dia. of downgate (in.)	1.25	1.50
Area ratio downgate to ingate ..	14 : 1	17 : 1
Weight of casting	5 cwt. 3 qr. 6 lb.	7 cwt. 3 qr. 7 lb.
Core frame strickle	¼ in.	¼ in.

FIG. 3.—*Second record card carrying information on moulding, coremaking, gating, etc., for a certain casting.*

Information Available

The foundry foreman is able, by turning up the index cards, to see the exact position of the pattern equipment, the moulding procedure he adopted on the last occasion that this particular type of pipe was made, and what troubles were encountered. Without this system, it would be necessary to have one mould made, cast, stripped and checked before going into full production, to ensure each time that everything was correct—and, bearing in mind that a different type is made nearly every day, considerable waiting time would occur. As it is, the foundry goes into full production straightaway, with a resultant saving of time and expense.

This system of pattern and quality control is essential for the efficient running of a mechanized foundry of this type. It should not be thought, however, that its application is confined to mechanized schemes. On the contrary, it would be to the advantage of every foundry, small or large, to introduce a system of pattern and moulding control. A system similar to the one described is bound to help towards efficient production, minimizing delays and reducing wastage.

Loam-block Pattern

By S. Lloyd

The purpose of this Paper is to describe, in general, the method of preparing a loam-block pattern, for the manufacture of special cast iron pipes up to 7 ft. 6 in. dia. (Fig. 4). Dealing first with tackle that is required from the patternshop, the main item, the block-plate pattern is constructed of timber 1-in. thick and is 9 to 12-in. longer at each end than the required casting, to allow for bearings. The width is about 5 in. more than the required bore, but where a socket end is required an extra strip 1-in. wide is fixed to each side of the plate, from the socket shoulder to the end of the bearing. Block-plate patterns are made to double contraction rule, but all the other items of pattern tackle—core, thickness, and socket-core strickle, socket-groove strickle, bridge and socket running-over strickle—are made to single-contraction.

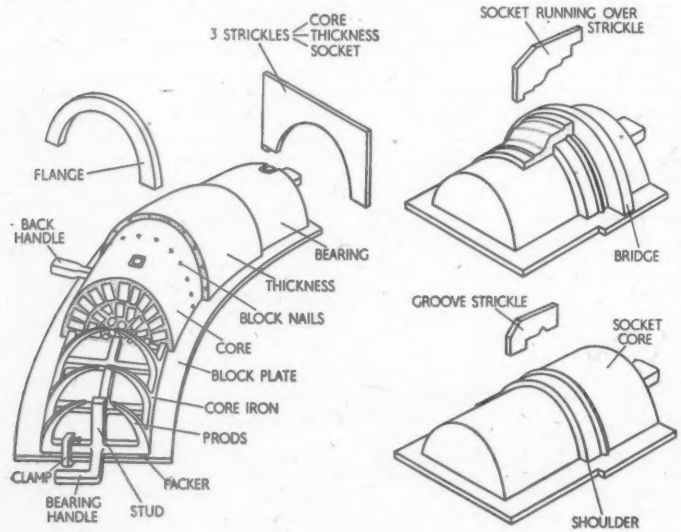


FIG. 4.—*Loam-block pattern (bottom-half); method of constructing the core and adding "thickness" to form the pattern.*

Operational Scheme

The block-plate pattern is placed on a prepared bed and sand is rammed round its perimeter to form an open mould, the depth of which may be increased beyond the pattern thickness if required. This procedure is repeated with the plate pattern inverted, and the two open moulds are then poured with cast iron, in the usual manner, thus giving top and bottom half block-plates.

Top- and bottom-half core-irons are also made on the bed, and are about 6 in. less in width than the diameter of the core. Bearing handles and a back

handle are cast on to facilitate lifting, the back handles being knocked off, and made up, before placing the loam-block pattern in the moulding box. The bearing handles are retained for locating and fixing the core.

Three studs, one at each end and one in the centre are cast on the bottom-half iron, the end ones, being in the bearings, rest on permanent packings in the moulding box, whilst the centre one is used in conjunction with a packing piece below the mould surface to accommodate a chaplet. The central stud only is required on the top iron for a chaplet, which is fixed through the moulding-box top to prevent the core lifting during casting.

Core Construction

Construction of both halves of the core next proceeds. Loam is placed on the block-plate and the core-iron is bedded into it, the iron resting on 1-in. thick "packers." The core strickles locate the iron on the plate, and after location the iron and plate are clamped together at the ends. Thin clay slurry is brushed on to the core-iron and bricking-up begins. Bricks and loam are built up between the prods, keeping the outer surface approximately ½-in. below the core strickle and leaving the centre of the core open. When the core is half built up in this manner, it is stoved overnight to make a firm foundation for the application of the remainder.

Coke and rubble are placed in the centre space and bricking up is completed, the remaining bricks in the top-half core being set 1½-in. below the core strickle. In order to be able to suspend the completed pattern by the core-iron in the bottom half when the back handles have been removed, a hole is left at the side of the central stud in the top-half core. The core-halves are again stoved overnight.

The half-cores are next wire brushed and caked all over with loam, straw rope being bedded on to the top-half core, where the bricks were inset 1½ in. and a slurry of loam is then applied and struck off with the core strickles to form the finished contour. The half-cores are then once more stoved, for approximately four hours.

Where a socket end has been formed, the shoulder is cut level with the end of the socket strips and square to the surface of the block-plate. The groove strickle is then used to apply the ridge of loam which forms the caulking groove in the casting.

The completed half-cores are now blacked and except on the bearing ends, blocked nails are knocked into the surface at about 6-in. centres with their heads protruding by an amount just less than the thickness of loam to be applied. Stiff loam is then spread over the core and struck off with the thickness strickle; a thin slurry is next applied and strickled off to give a good surface. At the socket-end, it is necessary to place a bridge over the bearing—square with the block-plate and at the correct distance from the socket shoulder. This is held in place whilst the socket profile is formed with the socket running-over strickle.

Assembly

The foundry marking-off table is set out by the patternmaker to receive the bottom half-block from the block-plate, using bearing lines and the socket face as setting points. The socket is then checked for alignment by the patternmaker, who next cuts away the excess length of thickness applied at the other end of the block, to form a square shoulder for a spigot, or a flange, whichever be required.

Steel bands are secured around the bottom half-block to support the thickness, it is then turned over and the top half is placed on it. Diameters are checked and the two halves are clamped together at the ends. Socket and spigot ends are squared up from the bottom half and steel bands are fastened around the now-completed loam-block pattern. From this pattern a mould is made and the thickness pieces are then removed to leave the completed core.

Shell Cores for Large-diameter Special Pipes*

By G. Brown*

Experimental work has shown that the use of resin-bonded hollow cores is the most satisfactory method of coring large-diameter special pipes in quantity production. Preliminary work indicated that this type of core was the easiest to produce in quantity and gave a high quality of finish to the bore of the pipe. This Paper discusses the methods of manufacturing these cores in large quantities with particular reference to the design of the tackle.

By virtue of the shape of the cores to be produced it is necessary to make them in halves, that is, split longitudinally on the centre-line of the circular section, and to join them after stoving. The coreboxes hereafter referred to are therefore semi-circular dishes, having a profile in plan view at joint level equivalent to the contour of the particular pipe.

Resin-bonded hollow cores can be produced by using heated coreboxes of the type mentioned above and by merely strickling the necessary thickness of sand over the face of the corebox. This method however would not meet quantity production requirements without excessive labour. Also working conditions by this method would be extremely unpleasant, and the method would result in thick and thin sections, with consequent possibilities of metal bursting through the core.

Production Method

For these reasons, a speedier and more reliable means of controlling the thickness is required. This is ensured by the use of a metal former supported at the extreme ends, and having a contour similar to that of the corebox, but leaving an annulus sufficient to give a core of the required thickness. This annulus between the corebox and the former has to be filled with a suitable sand mixture. A similarity exists between this process and normal

* A prize-winning entry.

Large Cast-iron Pipe Manufacture

shell moulding, in that the corebox is heated to give initial curing. For this reason the sand mixture must be admitted into the annulus evenly and quickly, otherwise "laps" occur on the surface of the core.

To ensure that the sand is brought to the point of entry quickly, a hopper system, attached to the former, was designed. These hoppers are attached to double-acting air-cylinders which move the hoppers across the top face of the former, until the outlet at the bottom is over the annulus to be filled. The return stroke of the air cylinders returns the hoppers over the former and in doing so cuts off the sand level with the joint. The hoppers are designed to hold an amount of sand slightly in excess of that required to fill the corebox and the surplus sand is retained in them.

The flow of sand from the hoppers into the annulus and complete consolidation of the sand to form the core are affected by vibration, the vibrating unit used being a standard electro-magnetic shake-out machine. Sand is fed into the hoppers by means of a feeder belt, even distribution over the length of the hoppers is thus ensured.

Operational Sequence

The following summary of the sequence of operations and diagrammatic sketches, Fig. 5 (*a*) to (*f*), illustrate the method of making a half-core:—

Operation 1.—Fill the hoppers with sand. (Fig. 5 (*a*).)

Operation 2.—The corebox at a temperature of approximately 280 deg. F. (138 deg. C.) is placed on the vibrator and the former complete with hoppers is located inside. (Fig. 5 (*b*).)

Operation 3.—Switch on the vibrator.

Operation 4.—Operate the air-cylinders, pushing the hoppers over the annulus. (Fig. 5 (*c*).)

Operation 5.—Consolidation is complete, vibrator is switched off and hoppers retracted over the former. (Fig. 5 (*d*).)

Operation 6.—Lift out the former. (*Fig.* 5 (*d*).)

Before the half-cores are finally stoved, a cast-iron core-grid with mild-steel cross-members is fitted to the drag-half cores (Fig. 5 (*f*)) and mild-steel cross-members only are set in the cope half. This core-iron bedded in the sand controls lifting and "rolling" in the case of bends, during casting. The core-irons and cross-members also facilitate handling during jointing of the halves and in coring up.

Curing and Finishing

The core-irons having been fitted, the final curing of the core is completed in a gas-fired continuous-tunnel-type stove, having independent bogies driven by chain conveyors. Passage through the stove takes between 20 and 30 min. at a temperature of 270 deg. C. Half-cores emerging from the stove are lifted clear of the corebox and placed on trestles for assembly. Jointing is effected with a resin compound whilst the cores are still hot. This is followed by a coating of blackwash and the core is then ready for use in the mould. Cores made by this process can be stored for an unlimited period, under reasonable conditions.

In conclusion, the Author would like to state that both the use of hollow cores and the method of production as described in the Paper are covered by Patents Nos. 19498 and 302 respectively.

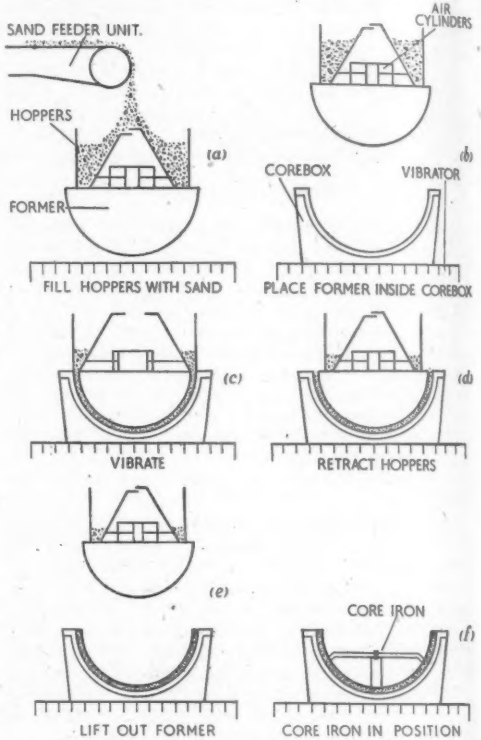


FIG. 5.—*Pictorial representation of the operational sequence in making hollow-pipe-bend cores in resin-bonded sand.*

Acknowledgments

Thanks to the Stanton Ironworks Company, Limited, for permission to present and publish these Papers are recorded by the respective Authors.

DISCUSSION

MR. ROXBURGH, referring to the resin core, asked Mr. Brown to indicate the type of sand and the percentage of resin. Also he inquired if on examination of the casting there were any marks on the inside such as little cold-laps or marks of that description where probably metal had not lain on the core too well. He also asked if one obtained an accurate core by this method.

MR. BROWN replied that the mixture consisted essentially of Leighton Buzzard sand and from 2 to 4 per cent. synthetic resin. He assured Mr. Roxburgh that no trouble had been experienced regarding metal lying on the face of the core, probably

due to the high permeability and also due to its being extremely thin in relation to its size. The accuracy was extremely good and no deformation was experienced during drying, because the core was finally cured in the corebox; furthermore, none had been noticed during casting.

MR. BOYES asked for an indication of the range of castings to which this particular method was applicable.

Range Produced

In reply, MR. BROWN said at present his firm was using this method on 20- to 27-in. dia. pipes, but he could foresee no limit, within reason, to the size of core which could be produced by the method—probably up to 36 or 42 in.

MR. J. HILL asked what was the approximate weight of the core, the rate of production, and how many men were employed coremaking.

MR. BROWN said the weight was from 2 to 4 cwt. and the rate of production was four to six per hour. The number of men employed was five.

A MEMBER asked if the centre of the core was filled in with backing sand and whether Mr. Brown experienced any break-out trouble.

MR. BROWN said the cores were used as produced, that is, hollow—the core was not filled for casting. The cores were worked at a minimum thickness in the interests of economy. This minimum had been established experimentally, leaving a small safety margin in excess of the point where metal tended to burst through.

Flow of Sand

MR. BOYES then asked whether any trouble was experienced with the flow of sand into the annulus, resulting in soft spots due to lack of flow, as on visiting the works he noticed that in addition to the vibrator the men used trowels to assist the flow of sand.

In reply, MR. BROWN said the reason for helping the sand along was because of the angle of the hopper in the centre—the outside face was vertical, while there was a rather shallow angle on the internal portion. The first sketch showed that the angle was controlled by the width of the former. With larger diameters of core, the angle increased slightly, and therefore the sand did not flow so easily to the point of entry, but afterwards there was no difficulty in getting it into the corebox.

Running System

MR. ROXBURGH asked whether conventional runners were used, and whether one could top-run a casting of this description or if it was necessary to run on the joint. He also asked if Mr. Brown would give some idea of the relation of the thickness of the shell, and also if the core was blacked.

MR. BROWN said that the same running systems were used for castings with green-sand cores and hollow cores. The actual practice was to run from the bottom using horn runners. Top running had never been considered. The thickness of the core was approximately 1¼ in., but varied slightly either way depending on the pipe diameter and thickness. The whole of the core was blacked.

MR. HAYDON asked if it was found that spillage was considerably reduced by the use of hoppers.

MR. BROWN replied that if hoppers were not used considerable spillage would result and the sand would not be admitted to the corebox as rapidly as was necessary.

Other Details

MR. FEARFIELD asked if urea resin had been tried.

MR. BROWN replied that many types of resin had been tried. It had been found that the normal type of urea resin broke down too rapidly for this particular application.

MR. ROXBURGH then asked if Mr. Brown thought it might be possible to blow the cores.

MR. BROWN said that there was nothing in principle against blowing the cores. However, if core-blowing was used, the core would need to be inverted and considering the size of the cores being made and the additional movement which would be required in the complete cycle it was considered that the present method was more economical.

MR. FEARFIELD asked if Mr. Brown would say what was the green-strength and moisture of the sand/resin mixture.

MR. BROWN replied the green strength was very low; no water was added to the mix.

A POWER STATION, occupying between 10 and 12 acres, and costing several million pounds, is to be built by Imperial Chemical Industries, Limited, at Thornton, near Fleetwood (Lancs).

A FURTHER 200 mine cars have been added to an order for 600 cars received by the Distington Engineering Company, Limited, Workington (Cumberland), from the North-Western Divisional Coal Board.

DELIVERY to the Steel Company of Wales, Limited, of an order for seven Diesel-electric shunting locomotives has begun from Brush Bagnall Traction, Limited, Loughborough, for use at the Abbey Works.

THE SYKES TOOL CORPORATION, Canadian associate of W. E. Sykes, Limited, Staines (Middx), is expanding its activities, and has appointed two agents in west Canada —one for Manitoba and Saskatchewan combined, and one for Alberta.

TWO SMOKELESS ZONES are to be designated by Birmingham Corporation within the next year. One of the zones, comprising 93 acres, will be in the city centre, while the other, of 110 acres, will be established in that part of the new Shard End Estate which is scheduled for industrial use.

UNDER a scheme of technological expansion Birmingham University will increase the number of science graduates, particularly those needed in industry, from 1,280 to 1,680 over a three-year period. The scheme will add up to £200,000 to the university's annual income from the University Grants Committee, says Dr. Robert Aitken, the Vice-Chancellor and Principal, in his 1954 report.

New Equipment

Self-compensating Tensioning Device for Belt Conveyors

The self-compensating belt-tensioning device, diagrammatically shown in Fig. 1 has been developed by Mavor & Coulson, Limited, Bridgeton, Glasgow. It makes use of the fact that with the maintenance of a coefficient of friction and the angle of wrap of belt round a driving drum B, the maximum ratio between the tension of the belt entering on contact with the driving drum and the tension of the belt leaving this contact remains constant.

By the arrangement of two movable pulleys, one on the ingoing belt run and the other on the outgoing run, each interconnected by rope to drums which have a ratio equivalent to the maximum ratio obtainable by the coefficient of friction and angle of wrap, the operation of this device is as follows:—

When at rest a uniform tension is maintained throughout the full length of the conveyor, this tension being the small amount of tension imparted to the belt manually to ensure that the belt does not sag between the carrying idlers when the belt is loaded. On starting the conveyor, the movable pulley A is moved forward by the ingoing belt due to the increase in its tension induced by the need to overcome the resistances to movement of the belt over the idlers and to the rotation of the idlers, pulleys, etc., in the conveyor system. Being restrained by its linkage by rope and compensating drums D to the compensating moving pulley C this tension is transmitted to pulley B and in consequence the slack-side tension in the belt is adjusted automatically and in the correct ratio without correction by an operator.

As the load carried by the belt varies, so the tension correction is adjusted only to the amount required for that load. Each change of load condition results in an automatically induced slack side tension sufficient

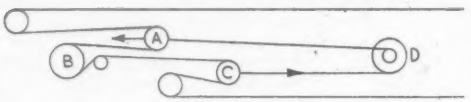


FIG. 1.—*Diagrammatic layout of the M & C self-compensating conveyor belt-tensioning device.*

to maintain the drive for the condition, and results in the lowest adequate tension being applied to the belt through the full range of loadings from empty to maximum load.

This accordingly allows correct tension to be used at all times during the operation of the system and subjects the belt throughout its operational life to the lowest possible correct tension. In addition, the tension in the belt when stationary is the least that will maintain the belt in its correct form and without undue sag between idler rollers when carrying material.

"Vacu-Blast" Cleaning Machine

An item of workshop equipment which makes shot-blasting possible in many industrial applications hitherto impracticable has been introduced by Vacu-Blast, Limited, 291, Aberdeen Avenue, Slough (Bucks). No protective clothing is needed and, furthermore, it is safe to use the machine only a few feet away from other apparatus. It is useful for cleaning surfaces in weld preparation, and for dressing welds after completion, besides being suitable for numerous other cleaning operations.

The Vacu-Blast "Junior," shown in Fig. 2, is simple in operation, compressed air being used to direct abrasive through a blast nozzle to the work surface with great force, after which a vacuum pick-up draws the cleanings and used abrasive through a return hose, attached to a blast gun, to a reclaimer where the abrasive is separated from the cleanings (or *débris*) ready for re-use. The cleanings are drawn off through the top of the reclaimer by a dust collector and deposited in a dust jar, cleaned air only being exhausted through an air filter dust bag which is fitted to the dust-collector air motor. The apparatus is completely air operated, and has no moving parts.

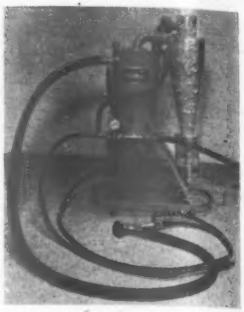


FIG. 2.—*Vacu-blast cleaning machine.*

Industrial Communications

Following the development of the "Clearcall" industrial communication system, and the many subsequent applications of the equipment in power stations, rolling mills, cement works, etc., the British Thomson-Houston Company, Limited, has developed a complementary "carrier-frequency" system for speech communication over existing power lines. One particular advantage of the scheme is that verbal messages can be transmitted between a fixed station on the ground and moving plant such as electrically operated overhead cranes and transporters.

Fundamentally, the system makes use of the same principles on which all sound radio broadcasting is based—that is, the transmission and reception of a high-frequency carrier wave which is itself modulated at frequencies within the audio frequency band. At each point where it is required to establish two-way conversation, a transmitter and receiver are installed suitably connected *via* protective coupling units to the existing power lines. In service, the transmitter (or "modulator," as it is more commonly known) behaves in much the same way as any conventional transmitter except that its output is fed to the power lines instead of an aerial; the receiver is tuned to the carrier frequency and by using conventional receiver circuits it reproduces the modulation as intelligible sounds in the loudspeaker. Because of the very strong signals available at the receiver input terminals—something like 1,000 times more powerful than those of a very-high-frequency radio link—relatively simple receiving circuitry can be employed with few valves.

PRIDE IN THE ACHIEVEMENTS of the Institute of British Carriage and Automobile Manufacturers was expressed by the chairman of the Midland Centre of the Institute, Mr. F. J. Locke when he spoke at the annual dinner in Birmingham on February 10. An output of 1,000,000 vehicles had been reached last year. If progress was to be maintained, 1955 would call for greater effort from everyone. The question of manpower would be difficult and the members of the Institute must design the tools to produce better and cheaper cars which could compete on the world markets.

Shell-moulding Processes

Recently, there was printed in the JOURNAL *a survey of precision casting methods in America. A similar survey has also been carried out in Germany and the following extract from it deals in particular with the position of shell-moulding in that country. An automatic method of clamping shell moulds in a turntable mechanism is described.*

Writing in *Metall* (vol. 23/24), December, 1954, Dr.-Ing. Th. Klingenstein, of Stuttgart, has reviewed the various methods of close-tolerance and precision casting which are practised to-day, including the processes generally known in the English-speaking countries as "shell moulding." As regards the control of tolerance obtainable, these casting methods stand roughly on a par with that obtained in die-casting, but many of the difficulties with the latter technique are avoided and the castings produced have a very good surface finish. Table I shows in general terms the limits of tolerance obtainable by different methods.

Casting method.	*Optimum tolerance on 30–50 mms. section.*
Sand Casting	± 1.0—2.0 mm.
Gravity die-casting	± 0.1—0.3 mm.
Pressure and Die-casting	± 0.05—0.2 mm.
Gypsum, Croning and Shaw Processes (Shell Moulding)	± 0.1—0.3 mm.
Mercury and Lost-wax Precision Casting	±0.03—0.1 mm.

One of the main problems with die-casting is the fact that the capital expenditure on moulds, etc., is very heavy and therefore long runs are essential to ensure amortization. The same, of course, applies in even greater degree to pressure-die-casting. Also there is the fact that high-melting-point metals are extremely difficult, if not actually impossible, to deal with in this manner. Shell moulding is often the solution to problems of this kind.

Croning Process

This method of shell moulding has been extensively described in the literature and is, generally well known. Its main drawbacks are that the necessary binding material is expensive and that in all cases metal patterns are essential. The economics of this process are therefore very much dependent upon wage rates. Mechanization of the process in order to reduce wage-costs is a relatively expensive business and also requires a relatively large number of patterns to be made. Such a departure is most to be recommended in cases where wages are high and the cost of the binder is low.

Castings can be turned out by the Croning process to a rather closer tolerance than is possible with sand moulding and with a very much better surface-finish, and for this reason in America an increasing proportion of cast crankshafts and similar items are made by this shell-moulding method. An advantage of the method is the fact that more castings can be made in a single Croning moulding than is possible in a sand mould, and therefore the losses in heads, risers and other unwanted portions can be substantially reduced, which is important when working in highly alloyed steel or expensive non-ferrous alloys. For ordinary grey-iron castings, however, the Croning process cannot compete economically with the standard sand-moulding procedure except in special circumstances.

Special Applications

The Croning process is thus in practice confined to the production of complex grey-iron castings, especially when these have to be held to a very close tolerance or turned out with a surface finish unobtainable in ordinary sand castings. The production of non-ferrous castings by this method is now of increasing importance and the process is also applicable to light alloys. There is no particular difficulty in casting ordinary non-ferrous alloys in shell moulds. Practically all the copper-base alloys can be dealt with in this manner once the different pouring techniques and mould-filling characteristics of the various alloys are known. In suitability, the copper/tin bronzes and the "red" alloys take first place, but the brasses, in particular the straight copper/zinc alloys, are inclined to give poor surface finishes. This is due to the high vapour-pressure of zinc and the speed with which areas of concentration of zinc oxide are built up on the surface of the casting. Results are excellent with the copper/aluminium series of alloys, the binary as well as the complex alloys, and the so-called "full-leaded" bronzes can also be quite satisfactorily cast into shell moulds. With the latter, however, the phenomenon known (in Germany) as "lead shirt" (*Bleihemd*) may appear. This is because in many of these alloys the lead remains liquid almost down to its fusion point while the rest of the alloy is already solid. During the solidification this lead is squeezed out to the surfaces due to shrinkage, and this can give rise to a film of lead (the "lead shirt") appearing over the outside surface. The phenomenon can, however, be largely avoided by controlling the gas content of the molten alloy before casting.

Surface Finish

It is useful also to consider other reasons why surface finishes may vary during the shell-moulding of various alloys. That the depth of surface roughness is proportional to the grain size of the moulding sand is obvious, but it will be found that different alloys may appear with different qualities of finish even though the same grade of

Shell-moulding Processes

moulding sand has been used. This may be partly accounted for by a difference in pouring temperature. The interstices between the individual sand grains in the shell mould are filled with the bonding resin, and when the metal enters the mould this resin is strongly heated and may start to burn. In the small interval of time between pouring and the formation of a solid surface to the casting, it is possible for some of the molten alloy to penetrate the spaces between the sand grains where the resin has burned away. Now different alloys fill the mould at different rates, which are closely linked with the surface-tension of the melt, so that the degree of penetration into the sand can be different and surfaces of varying degrees of roughness can be formed.

Closing Methods

The Croning process, while it can work to reasonably close limits of tolerance, unfortunately possesses a drawback common to all processes using moulds in two or more sections. The deviation from specified section in the direction at right angles to the parting plane is always liable to be larger than that in the other direction, owing to the formation of flash. Clamping the two shells together is one solution when the formation of flash is serious, another solution is to seal the two halves with a smear of resin around the parting line. This, however, is only economic when large items are being cast and when special arrangements can be made. For ordinary work, such a device is unlikely to be profitable.

In a South German works, the halves of the shell mould are assembled and held by means of compressed air and in this condition are filled while on a casting turntable. The moulds with the necessary cores are placed by hand on the turntable and automatically closed. They pass to the pouring point and then on to the unloading position; shortly before this is reached, the pressure is automatically released. The full mould is then removed and a fresh one takes its place. This casting turntable is shown in Fig. 1. It has places for six moulds altogether and can produce castings with practically no flash and which are within tolerance across the joint.

Gypsum Processes

The various gypsum processes, *e.g.*, the Bendix gypsum process, the Schaum gypsum process and the Antioch gypsum process (which are characterized by the addition of sand, asbestos, waterglass, calcium sulphate, etc., to the gypsum forming the mould) are little suited to mass production and repetition casting and are generally confined to the production of complicated items such as paddle wheels, pump parts, etc., in small runs.

These processes are extensively described in the literature. (See E. A. Canning in *Foundry*, 77 (1949) 2; pp. 74, 230, 232, 234; also Knight, *Iron Age*, 16 (1949 112; pp. 84-87.)

Shaw Process

The Shaw process, which has recently come to the fore, was developed in England. It closely resembles the Croning process in its operation, the difference being that the two halves of the mould are made up of quick-setting ceramic material. This is produced in a mould of hard gypsum and very quickly sets (in 3-5 min.). The mould is then heated in an open flame which drives off the alcohol contained in it, after which the ceramic mould halves are used in the same manner as in the Croning process.

The advantage of this process compared with the Croning method is the fact that wooden patterns may be used, provided these are treated with waterproof varnish. In this way, it is possible to produce economically special one-off items, such as dies, moulds, and the like. For mass-production, on the other hand, the process is not suitable, as the moulding material and the binding constituent are costly. The Shaw process is still undergoing development in a number of ways, for it has the merit of producing castings with very smooth surfaces. However, it still has the same drawback regarding tolerance that is common to the Croning process and all other split-mould processes, namely, the possible formation of flash along the parting line and the extra dimensional inaccuracy in one direction caused thereby.

FIG. 1. — *Turntable-type of mould assembly and casting machine for shell moulds, compressed-air operated.*

Precision Investment Methods

The casting processes which not only give a very fine surface but which also get round this flash problem are the precision investment methods. In these, of course, the mould is made all in one piece with no parting plane at all. The pattern can be removed through the gates and risers, being made either of frozen mercury or of wax. Both are easily fused and therefore if the mould be suspended the pattern is simply poured out. Precision casting, however, demands a very well-controlled technique (although the principle is centuries old), only economically applicable in very specialized circumstances.

How to Establish a Smokeless Zone

Some of the practical aspects of the conversion of a district to a smokeless zone were outlined by Mr. W. B. Kennedy, smoke abatement officer for Manchester, at a conference in Glasgow organized by the National Industrial Fuel Efficiency Service and the Scottish division of the Smoke Abatement Society. Before establishing its smokeless zone in 1952, Mr. Kennedy said, Manchester Corporation first carried out a survey of the selected area. Every occupier was interviewed and notice was given in December, 1950, that the smokeless zone would become operative in May, 1952. That was to allow adequate time for appliances to be altered so that no hardship would be caused.

The scheme was such a success, Mr. Kennedy continued, that prominent manufacturers demanded that the zone be extended, and accordingly three adjoining areas were surveyed. They were approved by the Minister of Housing and Local Government, and would become smokeless on May 1, 1955.

Dr. Joy Stern, of the scientific department of the Scottish Divisional Coal Board, told the conference that the suggestion in the report of the Beaver Committee that it was unlikely that domestic appliances could be designed to burn bituminous coal smokelessly was defeatist, especially as appliances were already available that gave appreciable smoke reduction.

Almost 200 delegates from town and county councils attended the conference, the purpose of which was to advise local authorities to review their local by-laws so that they could be ready with amendments for the Government's Clean Air Bill when it is introduced to Parliament this session.

French Order for Davy & United

An order to build a hydraulic wheel forging press of 6,000 tons' power has been placed with the Davy & United Engineering Company, Limited, Sheffield, by the French steel firm, Société Anonyme des Acieries et Forges de Firminy. The press will be similar to one of the same power built by Davy & United for the Steel, Peech & Tozer Branch of the United Steel Companies, Limited, some six years ago. It will be installed in the French company's works at Malo-les-Bains, and will be supplied with two 600-h.p. hydraulic pumps, a 400-gall. air hydraulic accumulator, a hydraulic intensifier, and other ancillary equipment.

The new press will be able to forge solid railway wheels up to 45 in. dia. and will represent the French company's first essay in producing wheels of "monobloc" form in anything approaching that size. It is expected that the greater part of the manufacturing work will be carried out at the works of Davy & United's Glasgow subsidiary, Duncan Stewart & Company, Limited.

Farewell to "Josephine"

It is said that when Mr. David William Edison Lloyd was sailing up the Thames on his return from the United States he saw on the north bank the activity at Dagenham where the vast works of the Ford Motor Company, Limited, was going up and determined to try for a job there next day. That was in 1931 and he became one of the inspectors who supervised the installation of "Josephine," Britain's southernmost blast furnace, and later was appointed the company's first blast-furnace superintendent.

Mr. Lloyd had been engaged in mechanical engineering in Pennsylvania, where he had gone from the South American Republic of San Domingo, after service in the Royal and Merchant navies. He was returning, however, to his first love—blast-furnace work— in which he had served his apprenticeship at the Dowlais Iron and Steel Works in his native Merthyr Tydfil.

On his retirement from Ford's recently, 65-year-old Mr. Lloyd received among farewell gifts a scale model of a section of the Dagenham furnace as a memento of his long association with it. In the course of that association "Josephine" and Mr. Lloyd claim a national record. The furnace was blown in during 1934 and was relined 10 years later. Since the relining it has produced to date over 1,936,317 tons of hot metal on one lining and a target of 2,000,000 tons is hoped for.

Shortage of Scientists

Reference to the shortage of high-grade scientists and technologists was made by Lord Salisbury, Lord President of the Council, in a speech read for him by Mr. Selwyn Lloyd, Minister of Supply, at a luncheon in London of the Parliamentary and Scientific Committee.

Lord Salisbury said that the Government was proposing considerably to expand the facilities for technological education in a number of universities and university colleges. We had still not nearly enough high-grade scientists and technologists. To fill the expanding university departments we must also increase the numbers of able young men and women coming forward from the schools. We had first to persuade more boys and girls who were reading science to stay on at school until the age of 18, and must then persuade far more men and women of the right type to adopt science teaching as a career. The prestige and interest of science and applied science must be raised and, what was most important, the interest in the teaching of those subjects.

Injured While Using Chisel

Judgment was given against Thomas Turton & Sons, Limited, Sheffield, for £1,900, with £59 special damages and costs, at Chester Assizes on February 14 in a case brought by a Chester workman, Albert Mason, Stamford Road, Blacon, claimed damages for personal injury, alleging that while using the chisel made by Thomas Turton & Sons, in the Chester works of Williams & Williams, Limited, to cut off the head of a screw, a chip of metal flew from the chisel into his eye. He contended that this happened because the chisel was too hard.

Mr. Justice Finnemore said employers who bought tools from a reputable firm were entitled to assume that they were in proper condition.

High-temperature Water-cooling

Interesting Possibilities Disclosed

Water-cooling of open-hearth furnaces is now standard practice, the amount of cooling depending on the design of the furnace. It is usual to to supply water with an inlet temperature of from 60 to 70 deg. F. which undergoes a temperature rise of up to 25 deg. F. before leaving the furnace. The subject was discussed by F. J. Feltoe and P. M. Moreton at a recent joint meeting of the Sheffield Society of Engineers and Metallurgists and the Yorkshire branch of the Institution of Mechanical Engineers. The authors pointed out that since the actual furnace-operating temperature is about 1,650 deg. C., it is obvious that an increase in the working temperature of the cooling water of from 165 to 225 deg. C. would not affect the performance of the furnace coolers, since the relative temperature gradient is still considerable.

This idea, although not new, has been put into practice at several steelworks in Germany, using a technique in which the heat normally lost in the furnace-cooling water is harnessed to produce useful work. The circulating system is designed so that each door frame or buckstay cooler is, in effect, a small water-tube boiler of the forced-circulation type. Briefly, water at the saturation temperature, corresponding to the pressure used, is pumped from a boiler drum through the various furnace coolers, in which the latent heat of evaporation is absorbed. The resulting steam-water mixture returns to the drum, where the steam separates and passes to a superheater, whilst the water, together with whatever make-up has been added, is again circulated around the coolers.

Although still in the experimental stage, plans are well advanced for installations operating at pressures up to 600 lb./sq. in., and several have operated successfully for over a year with pressures of about 150 lb./sq. in. In the latter case, the cooling medium would be at an average temperature of 185 deg. C. and in the former at 250 deg. C.

Advantages Claimed

This method of steam cooling has three major advantages over the conventional water-cooling systems. First, since treated water must be used, the quality of the water (hardness, *p*H value, etc.) can be exactly controlled, and the formation of scale on the inside of the coolers can be eliminated Deposits of sludge can be prevented or removed by blowing the system at suitable points, thus preventing local burning of the coolers, especially in the corners. This should result in a much longer life.

Secondly, in this steam-cooling system the maximum loss of water from the circuit is equal to the evaporation plus the "blowdown," and, depending on the use to which the steam is put, it may even be possible to return the condensate to the system, *i.e.*, if the steam were used simply for driving the circulation pumps and for electrical generation in condensing turbines. By this means the total make-up is very much less than in a normal cooling-tower circuit, where the water to be added would be from 3 to 4 per cent. of the total amount circulating. Figures show that compared with a 100-ton open-hearth furnace using a recirculating system employing a cooling tower, a similar furnace fitted with steam cooling can effect with 90 per cent. recovery of condensate, a water saving of 1,040 gal./hr.

Thirdly, the heat normally lost is available to produce useful work, and the following data relates to a plant operating in Germany: Capacity of furnace, tons, 100; steel production, 8.8 tons/hr.; number of doors equipped with steam cooling, 5; steam pressure, 590 lb./sq. in.; steam temp. (final), 275 deg. C.; steam produced per door, 1,750 lb./hr.; steam produced (all doors), 8,750 lb./hr.; steam produced in associated waste-heat boiler, 13,200 lb./hr.; total steam produced, 21,950 lb./hr.; steam produced per ton of steel, 2,500 lb.; percentage of furnace fuel heat recovered in steam, 60.

Discussing further possible applications, the authors stated that the high-temperature water cooling, with incidental production of steam, is by no means limited to open-hearth furnaces, and could be applied to steel re-heating furnaces and blast furnaces, but, as they point out, the introduction of new techniques such as this must on no account interfere with the prime function of these furnaces, namely, producing iron and steel. It would appear that such a system is equally applicable to cupola or electric-arc furnaces. In the steel industry, the value of heat savings tends to be overshadowed by the value of the product against which such savings must always be weighed, but it is to be expected that rising fuel costs, will, in the future, require more serious attention to be given, even to these comparatively untried developments.

Air Pollution at Steelworks

Margam and Abbey works of the Steel Company of Wales, Limited, in common with similar undertakings in other parts of the country, have their problems of atmospheric pollution. They derive in varying degree from the usual sources of dust and grit associated with iron and steel manufacture. Among these must be included iron-ore movements into and out of stock; grit arising from coke ovens during charging, coke-pushing, and quenching operations; from blast furnaces and steel furnaces. Remedies are being applied to prevent much of this pollution.

Fine-ore stocks at the sintering plant have been sheeted in to prevent grit being caught by the wind. On the coke ovens, the emission of dirty gas during charging is now prevented by what is called "charging on the main" which results in air being drawn into the system during the operation instead of gas being allowed to escape. Steam-borne dust during quenching the charged coke is being reduced by taking the cooling process in the quenching tower to a point where no further steam is given off to carry grit into the atmosphere when the coke is removed to the preparation plant. Surplus gas bled from the blast furnaces now is passed through the gas-cleaning plant before discharge. The problem of dealing with the fine iron-oxide fume given off at open-hearth furnaces using oxygen is under investigation, if possible to devise a method less costly than electrostatic precipitation.

News in Brief

ORDERS WORTH OVER £500,000 were recently received into the export offices of Leyland Motors, Limited, from the Indian sub-continent.

OUTPUT of ingots and castings from Sheffield and district steelworks during January averaged 52,300 tons a week—the best ever for that month.

MEADOW FOUNDRY COMPANY, LIMITED, Mansfield, cast-iron flanged-pipework manufacturers, are making some small extensions to their works.

THE ANNUAL GENERAL ASSEMBLY of the *Bureau International de la Récupération* is to be held in Lucerne, Switzerland, from May 25 to 27 inclusive.

A RECENT inquiry from overseas requested the supply of a complete set of copies of the FOUNDRY TRADE JOURNAL from the date of first publication (in 1902)!

THE SMETHWICK FIRM of Stone-Chance, Limited, of which Mr. John Raymond is managing director, is to move to the new satellite town at Crawley, Sussex, within the next 12 months.

PATERSON HUGHES ENGINEERING S.A. (Pty), Limited, has been appointed sole agents in South Africa for the Lister auto-truck, made by R. A. Lister & Company, Limited, of Dursley, Gloucestershire.

MEASUREMENT ENGINEERING, LIMITED, Arnprior, Ontario, has been appointed Canadian sales representative by Naresco Equipment Corporation, equipment sales subsidiary of National Research Corporation.

AT JANUARY 18, the official index figure, which measures changes in the average level of retail prices compared with the level at the base date (June 17, 1947, taken as 100), was 146, compared with 145 at December 14, 1954.

As from last Monday, the Glasgow office of British Electro Metallurgical Company will be at 266 Clyde Street, Glasgow, C.1 (tel.—Central 6454). Mr. William Paton, field representative for Scotland and parts of Northern England, will be in charge.

THE 150TH TANKER to be constructed by the company has been launched from the Haverton Hill-on-Tees yard of the Furness Shipbuilding Company, Limited. Named the Southern Satellite, the vessel, of 17,500 tons d.w., is for Chr. Salvesen & Company, Limited, Leith.

THE FIRST ORDER to be announced by the Caledon Shipbuilding & Engineering Company, Limited, Dundee, since September, 1953, is for two motor cargo liners, each of 10,000 tons d.w., for the Blue Funnel Line. The machinery will be supplied by Harland & Wolff, Limited, Belfast.

UNITED STEEL COMPANIES, LIMITED, of Sheffield announce that they have now opened a district sales office at 55/56 Scottish Provident Buildings, Donegal Square West, Belfast. (Telephone No.: Belfast 29604). The district office will be under the managership of Mr. J. A. I. Graham.

A NEW BRANCH OFFICE has been opened by the Ransome & Marles Bearing Company, Limited, Newark-on-Trent, in Scotland at 310, Perth Road, Dundee, Angus (telephone: Dundee 66155). The company's branch office in Leeds is now at St. Paul's House, 20-22, St. Paul's Street, Leeds, 1 (telephone: Leeds 32094).

FOUNDATION STONES have been laid for a new four-storey office extension at the Thornaby-on-Tees works of Head, Wrightson & Company, Limited. The extension, which will accommodate the personnel department, engineering division, secretarial staff and directors, and a new boardroom, is expected to be ready in July.

THE 28TH CONGRESS of the *Association Technique de Fonderie* is to be held in Paris on Thursday, Friday and Saturday of Whit-week—June 2, 3, and 4. At the moment 12 papers are scheduled to be presented including four from foreign sources. Amongst these is one from Mr. Van der Ben on behalf of the Institute of British Foundrymen.

THE NATIONAL SOCIETY OF MASTER PATTERNMAKERS is holding a general meeting on Wednesday, March 2, at 2 for 2.30 p.m. at the Bell Hotel, Leicester. Mr. S. H. Russell—chairman of S. Russell & Sons, Limited—will give an address entitled "The Foundryman and the Master Patternmaker." Afterwards normal Society business will be transacted.

HOYT METAL COMPANY of Great Britain, Limited, and F. W. Berk & Company, Limited, announce that they have jointly formed Abbey Chemicals, Limited, which company will process bentonite and manufacture chemicals. The registered office is at 1-19, New Oxford Street, London, W.C.1, and the works at West Ham. The authorized capital is £100,000.

OFF LAST WEEK on a business tour which will cover distances approaching 30,000 miles, Mr. M. J. Reaney, director and general manager of Colt Ventilation, Limited, Surbiton, has left this country by air for an extensive visit to the Far East, Australasia, Canada and the USA. Founded in 1931, Colt Ventilation, Limited, celebrate next year their silver jubilee.

THE CORNWALL SECTION of the Institution of Production Engineers is holding a two-day conference on "Compressed Air as an Aid to Improved Productivity" on April 13 and 14, at the Cornwall Technical College, Trevenson, near Camborne. Full details of the programme are available from the secretary of the Institution of Production Engineers, 10 Chesterfield Street, London, W.1.

THE SHEFFIELD SECTION of the National Trades Technical Societies has announced the postponement until the spring of 1956 of the projected exhibition of foundry plant and equipment which was being organized for May 16, 17 and 18 this year. Persons interested in booking space at next year's exhibition should write to the section secretary, Mr. W. H. Bolton, at 234, Brookhill, Sheffield, 3.

AN ORDER, valued at nearly £500,000, has been received by Richard Sutcliffe, Limited, Horbury, Wakefield, for the completed mechanical plant for the Irlam development scheme of the Lancashire Steel Corporation, Limited. The order includes 15 36-in. wide belt conveyors, five plate feeders and ancillary belt trippers, crusher and junction houses, wagon tippler, grizzly screens, and cone crushers. The materials to be handled are iron ore (both home and foreign), coal, and coke.

Dr. S. WERNICK, national secretary of the Institute of Metal Finishing, has advanced the suggestion that the time has arrived for the formation of a co-operative scheme for research into new finishing processes in which both industry and the universities should join. Co-operative research has already been practised in America for some time. In the Midlands, some firms are already helping research. Joseph Lucas, Limited, for instance, have endowed a fellowship in the subject, at Birmingham University.

AN INTENSIVE CAMPAIGN on safety has reduced the accident rate in the Grimethorpe foundry and fettling shops, which had the highest accident rate in the English Steel Corporation. Dr. J. C. Dadswell, director in charge of the foundry, wrote to every employee in the departments and spoke to all foremen. Mr. E. S. Harrison, safety officer, met the shop stewards. Boxes for ideas on accident prevention were placed at the time clocks

News in Brief

and large dials recording the numbers of accidents were set up at the works' gates.

NEWTON CHAMBERS & COMPANY, LIMITED, Thorncliffe Works, Sheffield, has paid out almost £2,000 to employees for ideas since a suggestions scheme was started nearly eight years ago. An average of 900 suggestions for the improvement of output and efficiency is being made each year. The cash awards are made for ideas which can be adopted by the company in practice. Accepted ideas are reviewed each half-year and supplementary awards are made for those which have been proved in practice to have a high value.

ALUMINIUM is to be extensively used in the £5,000,000 multi-storey block of shops and offices to be erected on the Big Top site in New Street, Birmingham, and for which planning permission has been received. The building is to be faced with aluminium curtain walling fixed between Portland stone vertical ribs, and all the windows are to be of aluminium framed with plastic panel infills. Standing 160 ft. above street level it will be the tallest building in Birmingham apart from the Birmingham University clock tower at Edgbaston.

AT THE ANNUAL GENERAL MEETING of Stewarts and Lloyds, Limited, Mr. A. G. Stewart, the chairman, told shareholders that the company, in conjunction with the Tata Iron & Steel Company, Limited, was erecting a continuous weld tubemaking plant at Jamshedpur, in India. The plant, he said, would be owned and operated by the Indian Tube Company (1953), Limited —in which Stewarts and Lloyds had a 40 per cent. interest and Tata the remaining 60 per cent.—and was expected to come into operation towards the end of 1955.

FURTHER APPEALS for tax relief have been submitted to the Chancellor of the Exchequer by the National Union of Manufacturers and the Leeds Chamber of Commerce. In its memorandum to Mr. Butler, the NUM urges a substantial relief in the rate and application of income tax on the grounds that it would provide "the most general incentive." The memorandum also declares that a substantial reduction in purchase tax would remove a serious distortion from the cost of living, and calls for the abolition of the undistributed profits tax.

"ELECTRICITY AND THE FUTURE" will be the theme of the seventh British Electrical Power Convention which is to be held at Brighton from June 27 to July 1, 1955. Associated with the Convention will be a comprehensive electrical exhibition, to be held in the Sports Stadium, West Street, Brighton, which will include a special display of electrical catering equipment. Altogether the exhibition will occupy approximately 25,000 sq. ft., and it will be open, free, to the public on certain weekdays. The exhibition will be officially opened by the president, Sir Harry Railing, on June 27.

AT A MEETING on February 15 of the Birmingham and District Industrial Safety group, Dr. J. Watkins-Pitchford, senior medical officer to the Ministry of Pensions and National Insurance, said that there did not seem to be any effective control over the frequency with which dermatitis cases occurred in industry. The Ministry had 25,000 claims a year for this disease. In contra distinction "amazingly few" British workers in industry or atomic plants had contracted disease or injury from radioactivity. He added that a recent addition to the Ministry's list of recognized "occupational hazards" was cadmium poisoning by fumes from metal plating.

A REPORT covering a six months' investigation of conditions at the South Wales ports, published by the Council for Wales and Monmouthshire (Stationery Office, price 1s. 3d.), submits for the consideration of the Government a recommendation suggesting the setting up by the British Transport Commission of an expert committee jointly by the railway and dock authorities to undertake an exhaustive review of the level and content of the rates for port traffic. It also recommends that the Minister for Welsh Affairs, in consultation with the Minister of Transport, should approach the Chamber of Shipping to enlist its support towards resolving the matter of the shipowners' and shippers' responsibilities for dock charges in South Wales.

ONE OF THE MOST UNUSUAL gifts that Princess Margaret will receive during her present tour of the West Indies was made in Birmingham in a week and flown to Jamaica, where it will be presented to the Princess on February 22 when she visits the Kingston plant of Alumina (Jamaica), Limited. It is an hour glass and although hour glasses—a normal product of Birmingham —usually have frames of brass or wood, the one for Princess Margaret is made of polished aluminium and instead of sand, the glass contains alumina, the powder obtained from the raw bauxite. At one end the glass has the Jamaican coat of arms in silver and at the other the inscription "Jamaica 1955." The silver work was done by Thomas Fattorini, Limited, of Birmingham, and the glass and frame by Max Gate, Limited, also of Birmingham.

GENERAL ELECTRIC COMPANY, LIMITED, which has acquired a factory in Station Road, Dudley Port, at present occupied by the Midland Expanding Metal Company, announced on February 15 a development which will be closely linked with the railway modernization scheme. The new premises, with 100,000 sq. ft. of factory space, are to be devoted exclusively to the manufacture of motors, generators and auxiliary machines for electric and Diesel-electric locomotives and rolling stock. The new works are to be a self-contained unit handling all processes from the raw material stage to the final assembly. Flow line methods of production will be adopted and the factory which, it is anticipated, will be in full production within twelve months, will have a potential output of more than £1,000,000 worth of equipment annually.

ASEE Exhibition Briefs

"MOTIVE POWER," the theme of the exhibition, might well be extended on stand Q196 to "Motive power—with safety," for there Newman Industries will place emphasis on their range of flame-proof motors. Exhibits of the normal types, from $\frac{1}{16}$- to 200-h.p., will also be on show.

AT the exhibition, British Insulated Callender's Cables, Limited is to include in its exhibit low-voltage indoor terminal-boxes; consumer's service units; detachable fused tee-boxes and claw-type cable cleats, as well as current-collection equipment for foundry cranes and conveyors.

ON stand 59 at the Electrical Engineers' Exhibition to be held at Earls Court, London, from March 15 to 19, J. A. Crabtree & Company, Limited, are showing a wide range of electrical wiring accessories, motor starters and remote-control stations. For use with the latter, pilot lights, suspension stations and push-button stations with mushroom-head or locked-off "stop" buttons in weatherproof or general-purpose patterns will be displayed.

Book Reviews

Guide Practique de Tracé des Pièces Mouleés en Fonte Grise (Practical Guide to the Design of Grey-iron Castings). Published by Editions Techniques des Industries de la Fonderie, 12, Avenue Raphaël, Paris 16; price: 800 francs.

Much thought is to-day being given to the design of castings and so far as the foundryman is concerned he will tend to stress those features which will enable him to produce a cheaper and better casting, with fewer rejects. Yet from the designer's point of view, he must take care of other considerations. He has to worry about compression and transverse strengths, notch effect, appearance, dimensional tolerances and machinability. Moreover, he expects some information on these subjects in any data book he may receive from the foundry industry.

This has been most admirably done by this book and though it is devoted to cast iron, yet there is much that is applicable to most other metals. Being of French origin, there is a logical approach to the subject and the designer is first given an insight into the properties of cast iron. Then, the subjects indicated above are dealt with, before relating design to the production of sound castings. Though the book only runs to about 60 pages, no fewer than 106 illustrations have been included.

There are two appendices of use to the patternmaker, who is so very often consulted by the designer. The first takes the form of a table, which recapitulates the methods of patternmaking and moulding which are best suited to the type of castings to be made and quantities required. The second carries a few simple notes on pattern construction related to stripping properties.

There is a final page of general injunctions to the designer—one of which is not to litter up drawings with innumerable dimensions—whilst others are commendably positive in their impact. The book carries a number of slogans, the last of which reads: "Don't haggle over the price of a pattern—it's money well spent." To readers, the reviewer would add: "Don't haggle over the price of this book—it will be money well spent" (especially if presented to the designer working for one's principal customer). V. C. F.

Foundry Work for the Amateur, by B. Terry Aspin. Published by Percival Marshall and Company, Limited, 19-20, Noel Street, London, W.1. Price 5s.

The number of amateur mechanics in this country who are engaged on the making of miniature locomotives, aeroplanes and the like, must be very large. In their work they use castings, but generally speaking, they buy them. However, this interesting little book tells the amateur mechanic how he can include a new craft—foundrywork—amongst his attainments. It is interesting to learn how oil-sand can be mixed by substituting a piece of stout bent wire for the tool in a portable electric drill. This is so much better than borrowing an egg-whisk from the kitchen! The book will appeal to the type of foundryman who finds real joy in improvization, as many examples of this kind of adaptation are given. V. C. F.

Publications Received

Conference on Works Transport. A Report published by the British Iron and Steel Research Association, 11, Park Lane, London, W.1; price 5s., post free.

The largest foundry concerns will have much interest in reading the Report of this conference. In large steel works it is not uncommon to find about 50 miles of sidings, whilst several thousands of wagons enter and depart each week. It is obvious that the accumulated experience of such big users of transport is of value to the larger units of the foundry industry. The Report contains ten papers and discussions.

Coal—The Price Structure. Published by the Federation of British Industries, 21, Tothill Street, London, S.W.1; price 2s.

According to this booklet, the price of coal is governed by the calorific value, modified by a points system to take care of the ash content and the group price. The consumer should know all about this, and the more he knows the better chance he has of getting what he pays for. Founders are therefore recommended to secure a copy of the booklet. Unfortunately, the question of coke price is not really dealt with.

House Organs

Gray Iron News, December 1954. Published by the Gray Iron Founders' Society Inc., National City, E. 6th Building, Cleveland 14, Ohio.

This issue covers some of the activities of the 26th annual meeting of the Society held at Hot Springs, Virginia. A main item was a resolution sent to a government department protesting against the export of iron scrap. Other matters dealt with are costing and specifications governing the inclusion of Brinell hardness. The latter contains some useful hints.

Carron Cupola January 1955. Issued by the Carron Company, Falkirk.

A feature in this issue, and a very good one, is the history of the Curtsey electric fire from its conception in the mind of the manager, through its design and manufacturer to the finished article. The whole has been carried out by captioned pictures.

Sif-Tips Vol. 17, No. 88. Issued by the Suffolk Iron Foundry (1920) Limited, Stowmarket.

In this number there are several very practical articles covering the repair of broken castings made in iron and aluminium as well as zinc-base die-castings. The last item deals with a motor-car carburettor-body, rightly described as a "tricky job."

S & W Magazine, January 1955. Issued by Smith and Wellstood, Limited, Bonnybridge, Scotland.

This issue announces an extension to the enamelling shop, which is to be devoted to giving more interesting colours to their productions.

A NEW British Standard (B.S. 2567: 1955) is one of a series for conveyors of various types. It specifies important dimensions of the principal components of fixed and portable roller conveyors, within the range of maximum loading from 10 lb. to 320 lb. per roller. The standard does not apply to power-driven roller conveyors. Copies of this standard may be obtained from the British Standards Institution, 2, Park Street, London, W.1. Price 2s. 6d. each.

SEVEN EMPLOYEES received certificates on their retirement from Archibald Kendrick & Sons, Limited, iron-founders, of Houghton Street, West Bromwich, recently. They were: Mr. A. W. Smith, 58 years' service; Mrs. M. A. Reed, 46 years; Miss A. Williams, 53 years; Mr. A. Whitehouse, 44 years; Mr. J. Cashmore, 40 years; Mr. H. Gresswell, 40 years and Mr. A. J. Smith, 44 years. Mrs. W. Kenrick, wife of the managing director made the presentations.

Personal

Mr. S. WINPENNY, docks engineer at Middlesbrough and West Hartlepool for eight years, has retired after 45 years' docks service. His successor is Mr. P. K. BROWN.

Mr. J. C. HOWARD, director of the Electric Furnace Company, Limited, of Weybridge, was the guest lecturer at a meeting held at the Carlton Hotel, Johannesburg, recently.

METROPOLITAN - VICKERS ELECTRICAL COMPANY, LIMITED, announces that Mr. R. P. HORLOCK has transferred to the Metropolitan-Vickers Electrical Export Company, Limited, as manager for Canada. Mr. Horlock has been succeeded by Mr. R. S. D. BAGNALL, who is now manager of the Sheffield office.

Mr. W. YOUNG, a senior engineer and ship surveyor in the London District Marine Survey Office of the Ministry of Transport and Civil Aviation, has been appointed principal officer of the West of Scotland Survey District, Glasgow. He succeeds Mr. G. BURDON, who is now deputy engineer surveyor in chief.

FOLLOWING THE ACCEPTANCE of the David Brown Corporation offer for the capital of Harrison McGregor & Guest, Limited, Major O. M. GUEST, Mr. H. COBDEN TURNER, Mr. M. T. EDGE, Lt.-Col. C. H. C. GUEST, Mr. W. DREW and Mr. T. C. L. WESTBROOK have all tendered their resignations from the Harrison McGregor & Guest Board.

Col. F. A. NEILL, chairman and managing director of James Neill & Company (Sheffield), Limited, tool manufacturers, has resigned as chairman of the East and West Ridings Regional Council of the Federation of British Industries, following his nomination as High Sheriff of Yorkshire. He is succeeded by Mr. F. BOWEN, deputy chairman and a member of the regional council since 1947.

Sir CHARLES GOODEVE, director of the British Iron and Steel Research Association, has been elected vice-chairman of the Parliamentary and Scientific Committee. Other elections include the appointment of Sir HUGH LINSTEAD, as chairman in the place of Sir WAVELL WAKEFIELD, and the appointments of Lord HALSBURY and Dr. R. F. B. BENNETT as a deputy chairman and an honorary secretary, respectively.

Mr. T. G. TATHAM of the H. E. Brehaut Company of Melbourne, Australia, returned home last Friday after an extensive visit to this country. Early this year, he made a three-week motor-car trip, taking in Lincoln, Edinburgh, the Lake District, Penzance, the South Coast, Dover, Canterbury and London, and with the exception of two days, encountered nothing but sunshine. During his stay in England, he investigated shell moulding with a view to its utilization in the Brehaut foundry.

Mr. JAMES ALLAN has retired from the Curtiss-Wright Corporation, the American engineering organization. After serving his apprenticeship as a machinist in Hamilton (Fife), Mr. Allan went to the US in 1910, becoming chief tool designer of the old Curtiss-Aeroplane & Motor Company in 1921. Transferring to the Wright Aeronautical Corporation 10 years later, he served as chief tool engineer, liaison, tool, and production engineer, process engineer, and official in charge of employee training.

A.P.V.-PARAMOUNT, LIMITED, Crawley, Sussex, announce that Mr. DONALD COLBRIDGE has been appointed chief methods engineer after many years' experience in a similar capacity with the David Brown Foundries Company. Mr. Colbridge was a member of the Steel Founders Productivity Team that visited the United States under the auspices of the Anglo-American Council on Productivity in 1949. Mr. DUNCAN STEWART has joined the firm as plant development engineer. Mr. Stewart, who was awarded the diploma of the National Foundry College in 1949, was previously employed by Harland & Wolfe, Limited, and, since 1942, by the British Steel Castings Research Association. Mr. A. B. HUNT, previously assistant melting-shop supervisor with F. H. Lloyd Company, Limited, of Wednesbury, with whom he has been associated since 1937, has resigned from this position to become steel melting-shop supervisor in charge of the arc and high-frequency electric-furnace plant.

Mr. J. H. WIGGLESWORTH, general secretary of the Iron and Steel Metal Dressers' Trade Society, on February 10 opened the new baths at the works of Crofts (Engineers), Limited, Bradford. The new facilities provide accommodation for about 600 foundry employees. Under the care of full-time attendants, the facilities include dressing and locker rooms, drying rooms for clothing, as well as shower and foot-baths. Mr. Wigglesworth said he saw no reason why men working in a foundry should not go home at night, dressed ready to take their wives to any social event in town. He had started work in a foundry over 60 years ago and in that time foundries had made great progress. He suggested that if the management found a man refusing to use the baths they might consider sending for his wife to show her how her husband could go home at night. Mr. JOHN A. CROFT, deputy chairman of the company, stressed that since the foundation of the firm it had been the policy of the directors to ensure for all employees the best possible amenities. Some 350 wives of foundry workers were afforded a preview of the baths on February 12, when they were entertained to tea by the firm.

Obituary

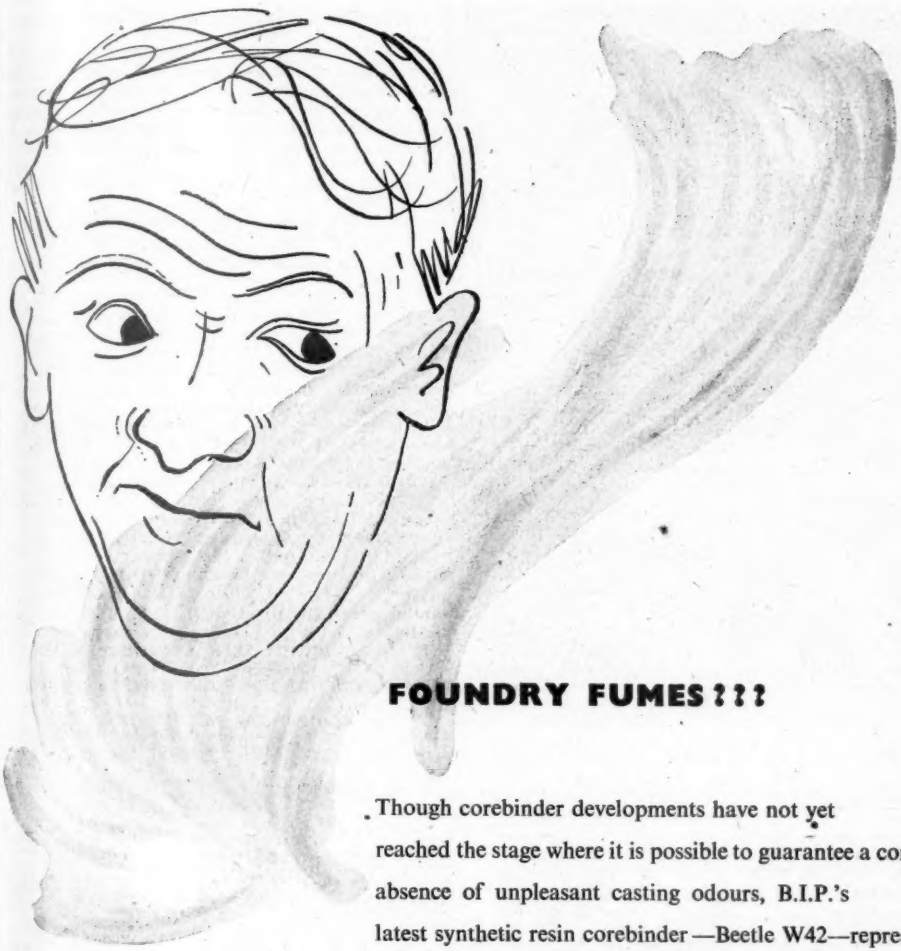
Mr. JOHN WHELAN DULANTY, who died on February 11, in 1950 became the first Irish Ambassador to London. At one time he was secretary of the Faculty of Technology at Manchester University.

Mr. JOSEPH HASELDEN KING, chairman of King Bros. (Stourbridge), Limited, manufacturers of gas retorts, bricks, and fireclay goods, of Stourbridge (Worcs) and Cradley Heath (Staffs), died on February 11.

THE DEATH has occurred of Mr. THOMAS T. BROWN, a director of Swinney Bros., Limited, ironfounders, etc., of Morpeth (Northumberland). He joined the company in 1923 and became technical manager and a director in 1935.

Mr. H. S. CARNEGIE, M.I.Mech.E., M.I.E.E., who died recently at the age of 67, was head of the special engineering section of the Stafford works of the English Electric Company, Limited, and a member of the chief engineer's staff on special duties. He had been associated with English Electric and its predecessors for 41 years.

Mr. REGINALD HUGH ROBERTS of Stratford-upon-Avon, died on February 13 at the age of 72. From 1920 to 1945 he was chairman of Fisher & Ludlow Company, Limited, and other firms with which he was associated include the Steel Nut & Joseph Hampton, Limited, of Wednesbury; Edwin Showell & Sons, Limited; Hart Son; Peard & Company; Super Oil Seals and Gaskets, Limited, and Birmingham Guild, Limited. In 1924 Mr. Roberts introduced the manufacture of steel bodies for cars, a fact which marked the transformation of Fisher & Ludlows from a small concern to the present large undertaking. He served on the Grand Council of the Federation of British Industries.



FOUNDRY FUMES???

Though corebinder developments have not yet reached the stage where it is possible to guarantee a complete absence of unpleasant casting odours, B.I.P.'s latest synthetic resin corebinder—Beetle W42—represents a very considerable advance in this direction. Developed with the Garrett Report in mind, it combines all the advantages of Beetle W20 with a reduction in casting odour that will be appreciated by foundrymen.

use* BEETLE RESIN W42* *for reduced casting odour

B·I·P

Write for technical information to B.I.P. Chemicals Limited,
Tat Bank House, Oldbury, Nr. Birmingham. London Office : 1 Argyll Street, W.1.
'Beetle' is a trade mark registered in Great Britain and in most countries of the World.

**Patent Application 32896/58*

Company News

GIBBONS (DUDLEY), LIMITED, makers of gas retorts, fireclay goods, etc.—An extra-ordinary meeting is called for March 7 to effect the three-for-two scrip issue to holders registered on February 11.

STEETLEY COMPANY, LIMITED—The company is paying 3 per cent. more for 1954, with a 9 per cent. final dividend recommendation which makes a total of 13 per cent. In the previous 12 months shareholders of the £1,851,583 ordinary capital received a 7 per cent. final, making a 10 per cent. annual distribution.

ENGLISH ELECTRIC COMPANY, LIMITED—For the year ended December 25 a final dividend of 8½ per cent. is recommended, making a total of 12½ per cent. This compares with the equivalent of 9⅛ per cent. in the previous year, in which the interim was paid, before rights and scrip issues, on only half the present ordinary capital of £10,616,193.

INTERNATIONAL COMBUSTION (HOLDINGS), LIMITED—A final dividend of 15 per cent. is recommended to make 25 per cent. for the year ended September 30, 1954, on its £1,918,490 ordinary capital, comparing with 20 per cent. in the previous year when a similar final was paid. The interim was doubled to 10 per cent., however, in respect of 1953-54.

PARSONS ENGINEERING COMPANY, LIMITED—Output in the year to October 31 last was almost 50 per cent. in excess of that of the previous 12 months, which was a record year. Net profits, however, were not correspondingly increased owing to rising costs and competition, but rose from £14,073 to £23,234 before tax of £10,332 (nil). The dividend was repeated at 10 per cent.

RAILWAY & GENERAL ENGINEERING COMPANY, LIMITED—The directors advise acceptance of the revised offer of 25s. per 5½ per cent. cumulative £1 preference and 5s. per 2s. ordinary share received from H. J. Baldwin & Company, Limited, last month. They state that 25s. now offered for the preference is substantially in excess of the market value of the shares and the only ground on which the board could advise preference shareholders to refuse the offer would be any desire on their part to prevent change of control. The directors consider that 5s. for the ordinary reflects more realistically the increased earnings capacity and prospects and regard the price as a fair one.

Board Changes

LIGHTALLOYS, LIMITED—Mr. Clifford Waite has joined the board.

VONO INDUSTRIAL PRODUCTS, LIMITED—Mr. Stephen F. Burman has joined the board.

SUPER ALLOYS, LIMITED—Mr. John G. Lawson has retired from the board and has ceased to act on behalf of the company.

MARSHALL CASTINGS, LIMITED—Mr. David Daniels has been appointed chairman in succession to Mr. John G. Lawson, who has resigned.

CATALIN, LIMITED—Mr. A. J. Perryman, who is in charge of the products division, and Dr. F. L. Gilbert, in charge of the development and commercial activities of the industrial resin division, have joined the board.

POWER JETS (RESEARCH & DEVELOPMENT), LIMITED—Capt. (E) E. A. G. Whittle, RN, and Mr. J. H. Pitchford, managing director of Ricardo & Company Engineers (1927), Limited, have joined the board. Capt. (E) E. J. H. Kirby, RN, has resigned from the board on change of Admiralty duties and Rear Admiral W. G. Cowland has resigned due to pressure of other work.

Lloyd's Shipbuilding Returns

Lloyd's Register of shipbuilding returns relating to merchant ships of 100 tons gross and upwards, for the quarter ended December, 1954, shows that in Great Britain and Northern Ireland at that date, steamships and motorships under construction totalled 327 ships of 2,140,752 gross tons, compared with 316 ships of 2,058,457 tons in the previous quarter. The total includes 117 steamers of 1,236,896 tons and 210 motorships of 903,856 tons.

In the remainder of the Commonwealth 44 ships of 117,181 tons were under construction, compared with 45 ships of 130,473 tons in the September quarter, these vessels including 18 steamers of 33,084 tons and 26 motorships of 84,097 tons. Oil tankers of 1,000 tons and upwards building in Great Britain and Northern Ireland totalled 83 ships of 1,123,008 tons compared with 83 ships of 1,093,530 tons in the September quarter, and representing 52.5 per cent. of the total tonnage under construction in this country. World figures of ships being built totalled 278 steamers of 2,686,148 tons and 887 motorships of 3,167,609 tons, making a total of 1,169 ships of 5,854,247 tons (including a few small wooden vessels), compared with 1,065 ships of 5,499,078 tons in the previous quarter. Ships under construction in the principal districts of Great Britain and Northern Ireland are shown in Table I.

The sizes of steamships and motorships under construction in Great Britain and Northern Ireland in the December quarter were as follow:—100 to 1,000 tons, 17 steam (89 motor); 1,000 to 2,000 tons, 5 steam (16); 2,000 to 4,000 tons, 13 steam (13); 4,000 to 6,000 tons, 3 steam (16); 6,000 to 8,000 tons, 12 steam (25); 8,000 to 10,000 tons, 10 steam (17); 10,000 to 15,000 tons, 21 steam (33); 15,000 to 20,000 tons, 14 steam (1); 20,000 to 25,000 tons, 20 steam (nil); 30,000 tons and over, 2 steam (nil).

TABLE I.—*Ships under Construction in Principal Districts of Great Britain and Northern Ireland.*

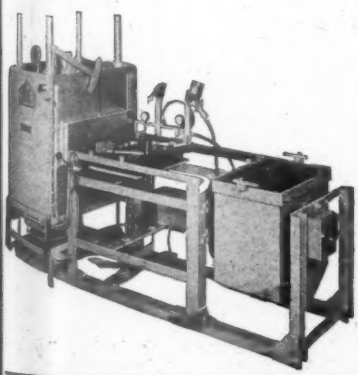
District.	December 31, 1954.		September 30, 1954.		December 31, 1953.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Aberdeen ..	17	23,429	16	21,170	14	27,580
Barrow ..	5	105,140	5	97,750	6	119,130
Belfast ..	20	248,780	17	194,350	17	219,560
Bristol ..	6	3,160	6	3,820	4	2,880
Clyde—						
Glasgow ..	67	488,609	76	475,724	78	527,784
Greenock ..	27	191,430	30	205,215	32	214,687
Dundee ..	5	30,300	6	43,800	6	42,950
Hartlepool ..	6	35,596	9	56,069	8	49,555
Hull	30	14,357	28	12,917	21	11,722
Leith	13	30,270	14	43,216	16	50,380
Liverpool ..	18	133,798	16	122,613	16	131,241
Middlesbrough	16	203,900*	15	197,162	16	196,674
Newcastle-on-Tyne	38	376,195	34	364,585	40	368,248
Southampton	5	6,584	3	5,434	4	6,224
Sunderland ..	30	226,765	27	206,927	30	202,915

World Power Conference

"World Energy Resources in the Light of Recent Technical and Economic Developments" has been chosen as the main theme of the fifth plenary World Power Conference, to be held in Vienna from June 17-23, 1956. A committee has been appointed to make arrangements for the preparation of British papers. Communications should be addressed to the secretary of the British National Committee, World Power Conference, 201-2, Grand Buildings, Trafalgar Square, London, W.C.2.

SHELL MOULDING AT LOW COST

The Shelmolda ' Duplus ' is low in first cost, economical to operate and costs little to maintain. Its design is simple and straightforward, yet it has the advantages of more complicated and costly apparatus. Operation is semi-automatic, with all the strenuous work carried out mechanically. The patent oven is thermostatically controlled and gives the machine a proved capacity of 50/60 moulds per hour. Pattern plates measure 24in. by 16in. and the maximum depth of pattern is 5in. Floor space required is 8ft. 6in. by 3ft. 3in. and the machine is operated by one man. Delivery is 8 to 10 weeks.



Shelmolda

DUPLUS

PATENT APPLIED FOR

FAIRBAIRN LAWSON COMBE BARBOUR LTD

LEEDS, ENGLAND. Telephone : Leeds 32041

AP 236-73

Raw Material Markets

Iron and Steel

Substantial additions to blast-furnace capacity which are due for completion this year should add appreciably to pig-iron production, so that during the year output figures should show an increase on those now being obtained, assuming that the required supplies of raw materials are available. Iron-ore deliveries are on a large scale, and it is assumed that arrangements have been made to acquire the higher tonnages which will be required. The supply of blast-furnace coke presents a more difficult problem, but increased coking capacity is under way.

Most of the new furnaces are scheduled for the production of steelmaking iron, but some improvement in the supply of hematite for the foundries may be expected when a new furnace producing this grade is blown in on the West Coast later in the year. In the main, however, no appreciable improvement can be foreseen in the supply of the foundry grades of pig-iron, particularly the low- and medium-phosphorus irons. The engineering and speciality foundries, all of which are very busy, are very short of these irons.

All available supplies of hematite are being taken up and refined-iron makers are also covered for their outputs for some weeks ahead. From the furnaces now producing the high-phosphorus irons continued improvement in outputs may be expected as mechanical difficulties at new units are overcome and improved weather allows for freer movement of raw materials. Business at the light, jobbing, and textile foundries is now on a good scale, and they have work on hand which calls for increased tonnages of pig-iron.

The re-rolling mills have good order-books, especially for small bars, but are handicapped by the continued shortage of semi-finished steel. The general demand for finished products is maintained, with the heaviest pressure still on the sheet mills.

Non-ferrous Metals

Consumption of non-ferrous metals in this country kept up well until the end of the year. During December figures issued by the British Bureau of Non-Ferrous Metal Statistics show our usage of copper at 53,496 tons, of which 41,059 tons were refined. This compares with 52,382 tons in November, of which 42,846 tons were in the form of refined copper. Stocks at December 31 were 61,480 tons, compared with 61,673 tons a month earlier. For the whole of 1954 the UK consumed 574,376 tons of copper, of which 438,651 tons were in the form of refined material, which was about 116,000 tons up on 1953.

In zinc, consumption in December was 29,344 tons, of which 22,245 tons were in the form of virgin. In November, the corresponding figures were 27,901 tons and 21,233 tons. Stocks at the end of the year were 49,554 tons, compared with 51,226 tons at November 30. During 1954 the country absorbed 240,362 tons of virgin zinc, compared with 193,058 tons in the preceeding year. In lead the outstanding feature was a rise in stocks in the UK—from 26,937 tons at the end of November to 31,173 tons at December 31. Consumption in December was 28,840 tons, against 30,142 tons in November. The year made a good finish in tin, for the December figure of consumption was 1,952 tons, making 21,163 tons for the year, or about 2,500 tons up on 1953 returns.

Markets last week were unsettled. So far as copper was concerned, the steady improvement in the Copperbelt strike situation and the statement issued by the Northern Rhodesia Chamber of Mines bearing upon the re-engagement of African employees had an effect on values, which gave way sharply in midweek. On the other hand, a 24-hour strike was staged at the El Teniente mine in Chile. Obviously the consequent loss of output did not amount to much, but the market was sobered by this indication of possible trouble in Chile. On balance copper closed slightly above the worst at a loss of £19 for cash and three months. Zinc was down £3 prompt and £1 10s. forward, while lead fell by 30s. and £2. Tin closed £3 10s. down for cash and £2 lower for three months.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* February 17, £338 to £339; February 18, £338 to £340; February 21, £336 to £337; February 22, £331 to £332; February 23, £335 to £336.

Three Months: February 17, £324 to £325; February 18, £323 to £324; February 21, £320 to £321; February 22, £317 to £317 10s.; February 23, £321 10s. to £322 10s.

TIN, Standard—*Cash:* February 17, £707 to £708; February 18, £710 to £711; February 21, £708 to £709; February 22, £705 10s. to £706 10s.; February 23, £710 to £711.

Three Months: February 17, £711 to £712; February 18, £712 to £713; February 21, £712 to £713; February 22, £709 10s. to £710; February 23, £712 10s. to £714.

ZINC—*Second half February:* February 17, £89 5s. to £89 15s.; February 18, £88 15s. to £89; February 21, £88 to £88 10s.; February 22, £87 10s. to £87 15s.; February 23, £88 5s. to £88 15s.

Second half May: February 17, £87 5s. to £87 10s.; February 18, £87 to £87 5s.; February 21, £86 10s. to £86 15s.; February 22, £86 5s. to £86 10s.; February 23, £87 5s. to £87 10s.

LEAD—*Second half February:* February 17, £102 15s. to £103; February 18, £102 15s. to £103; February 21, £102 15s. to £103; February 22, £102 5s. to £102 10s.; February 23, £103 to £103 5s.

Second half May: February 17, £102 5s. to £102 10s.; February 18, £102 5s. to £102 10s.; February 21, £102 5s. to £102 10s.; February 22, £101 10s. to £101 15s.; February 23, £102 5s. to £102 10s.

Film Review

Cast Iron that Bends. The main features of the process for producing spheroidal-graphite cast iron, and the properties obtained, are the subject of a 16-mm. colour film "S.G. Iron: Cast Iron that Bends," recently prepared by the Mond Nickel Company, Limited. It is now available for loan to technical societies, colleges and schools. Foundry production, including magnesium treatment, is well illustrated, and the properties typical of s.-g. iron are demonstrated by now familiar shots showing bend, twist, impact, shock, tensile, and machining tests in action, and by reference to some of the many applications in which the properties of this iron are being utilized. These include earth rammers and ploughshare points, gears, valves, pistons, bumper plates and other parts in which high strength and wear- and shock-resistance are essential. The film has a sound commentary and runs for 17 min.

MELLOR MINERAL MILLS, LIMITED, Etruria Vale, Stoke-on-Trent, announce the marketing of "Dohmseal," a plastic refractory sold in the form of a ready-to-use paste.

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CUTS CARRYING COSTS!

Use it with Skip or Platform (they are *instantly* interchangeable) for carrying

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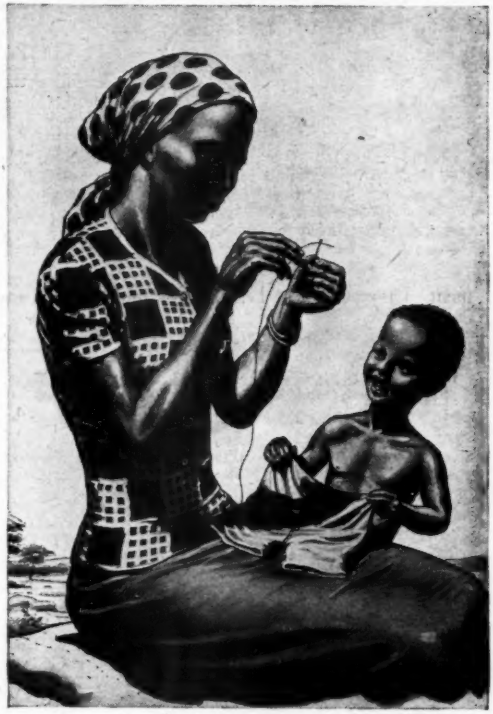

Patch work

TORN TROUSERS are the same the whole world over. So are the needles that mend them.

The needles, in all probability, were made in Britain. In 1954 about one thousand million assorted needles (weighing over 270 tons) went overseas. Along with them went nearly 1,100 tons of pins and over two and a quarter million gross of hair pins, slides, grips and curlers!

These export figures are remarkable: so are the figures for an enormous range of British steel products — from tins to tractors.

Wherever there is steel there is British steel.

British steel leads the world

THE BRITISH IRON AND STEEL FEDERATION
S.91

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

February 23, 1955

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £15 12s. 0d.; Birmingham, £15 5s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 13s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £18 9s. 3d.

Scotch Iron.—No. 3 foundry, £18 2s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £20 4s. 0d.; South Zone, £20 6s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £21 1s. 6d.; South Zone, £21 4s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £18 2s. 6d.; Scotland (Scotch iron), £18 9s. 0d.; Sheffield, £19 7s. 6d.; Birmingham, £19 14s. 6d.; Wales (Welsh iron), £18 9s. 0d.

Basic Pig-iron.—£15 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots).—40/55 per cent., £40 15s. 0d., basis 45 per cent. Si, scale 15s. per unit; 70/84 per cent., £63 0s. 0d., basis 75 per cent. Si, scale 16s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 11s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £161 0s. 0d. to £165 0s. 0d. per ton; 38/40 per cent., £258 0s. 0d. to £262 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 18s. 0d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 21s. 0d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £78 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £76 0s. 0d. to £78 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C,* 1s. 8½d. per lb. Cr; 1 per cent. C,* 1s. 9d. per lb. Cr; 0.15 per cent. C,* 1s. 11½d. per lb. Cr; 0.10 per cent. C,* 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 6½d. to 7s. 1d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £54 15s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 5s. 0d.; tested, 0.08 to 0.25 per cent. C, £26 5s. 0d.; hard (0.41 to 0.60 per cent. C), £27 10s. 0d.; silico-manganese, £34 10s. 0d.; free-cutting, £29 6s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 17s. 0d.; silico-manganese, £34 10s. 0d.

* Average 68-70 per cent. Cr.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 15s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £33 11s. 6d.; floor plates (N.-E. Coast), £32 10s. 6d.; sectional material, N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 19s. 6d.; flats, 5 in. wide and under, £31 19s. 6d.; hoop and strip, £33 1s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £34 5s. 0d.; black sheets (hand mill), 17/20 g., £43 13s. 6d.; galvanized corrugated sheets, 24 g., £54 17s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £54 7s. 9d.; nickel-chrome, £76 7s. 9d.; nickel-chrome-molybdenum, £86 8s. 6d.

NON-FERROUS METALS

Copper.—Cash, £335 0s. 0d. to £336 0s. 0d.; three months, £321 10s. 0d. to £322 10s. 0d.; settlement, £336 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 3s. 2½d. per lb.; rods 378s. 9d. per cwt. basis; 20 s.w.g., 408s. 3d. per cwt.

Tin.—Cash, £710 0s. 0d. to £711 0s. 0d.; three months, £712 10s. 0d. to £714 0s. 0d.; settlement, £711 0s. 0d.

Zinc.—Second half February, £88 5s. 0d. to £88 15s. 0d.; second half May, £87 5s. 0d. to £87 10s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £118 15s. 0d.; rolled zinc (boiler plates), all English destinations, £116 10s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £103 0s. 0d.

Lead (Refined Pig).—Second half February, £103 0s. 0d. to £103 5s. 0d.; second half May, £102 5s. 0d. to £102 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 8½d. per lb.; rods, drawn, 3s. 5½d.; sheets to 10 w.g., 342s. per cwt.; wire, 3s. 3d.; rolled metal, 328s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £216; B6 (85/15), £300; BS249, £250.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £262; HTB2 (38 tons), £274; HTB3 (48 tons), £285.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LG2 (85/5/5/5), £287; LG3 (86/7/5/2), £298; G1 (88/10/2/½), £379; (88/10/2/1), £370.

Phosphor Bronze.—BS1400, PB1 (AID released), £400 per ton.

Phosphor Bronze Strip, etc.—Strip, 462s. 0d. per cwt.; sheets to 10 w.g., 484s. 6d. per cwt.; wire, 4s. 8½d. per lb.; rods, 4s. 1½d.; tubes, 3s. 11½d.; chill cast bars: solids 4s. 1½d., cored 4s. 2½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 3½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £109 0s. 0d. to £110 0s. 0d. Nickel, £519 0s. 0d. Aluminium, ingots, £163 0s. 0d.; aluminium bronze (BS1400), AB1, £338; AB2, £343. Solder, brazing, BS1845, 2s. 6d. lb.; granulated, 2s. 9d. lb.